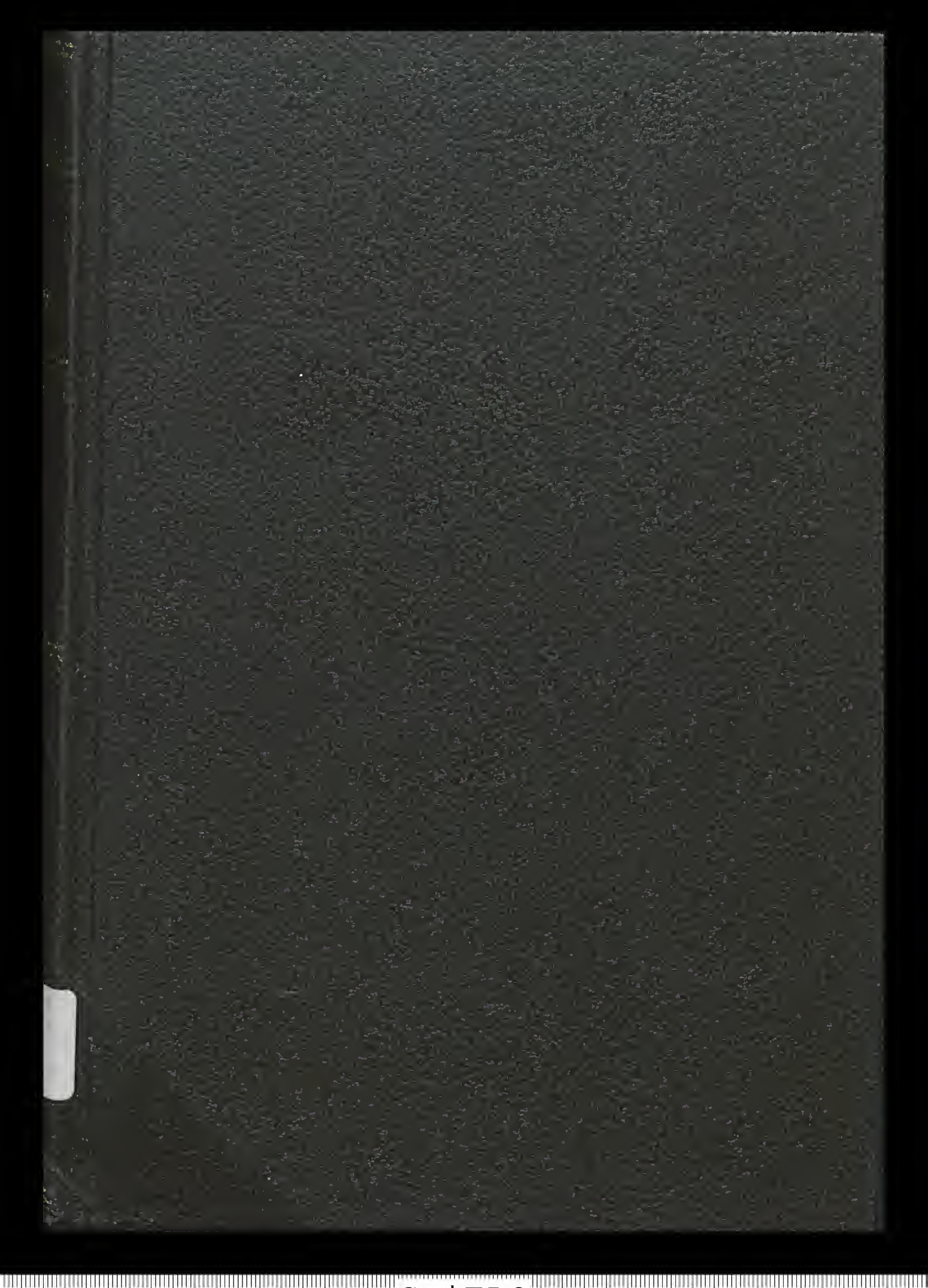
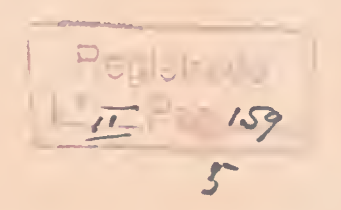



ENCADERNADORA
KRISTINA LTDA.
R. José Bonifácio, 176 - S/Loja 8/9
Fone: (011) 232-2183 - 3106-0356 - 3107-1398
Fax: (011) 232-1750

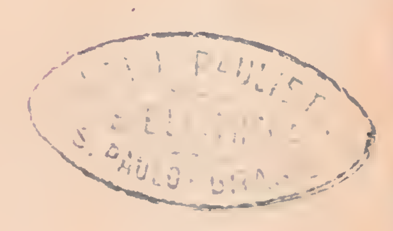
LIVRO JUBILAR
DO
PROFESSOR LAURO TRAVASSOS

Editado para commemorar o 25° anniversario de suas actividades scientificas

(1913 — 1938)







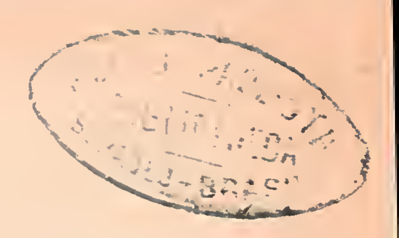
RIO DE JANEIRO, BRASIL
1938







J. Pinto, phot.



Lauro Travassos

por

Arthur Neiva

Chefe de serviço do Instituto Oswaldo Cruz

Em Dezembro de 1937, sob o titulo *Monographias*, o Instituto Oswaldo Cruz iniciava nova série de publicações. Até então os trabalhos eram divulgados atravez de suas *Memorias*, porém como a actividade scientifica crescesse houve imperiosa necessidade de se organisar novo typo de divulgação. Coube a Lauro Travassos com a «Revisão da familia *Trichostrongylidae* Leiper, 1912», alentada contribuição scientifica com 512 pp., 297 ests., e 1260 figs. escrever o primeiro trabalho para a nova publicação, contribuição essa que tem o numero 211 na lista de trabalhos scientificos do notavel pesquisador em cuja homenagem se fez este *Livro Jubilar* áfim de commemorar o 25° anniversario de sua actividade scientifica.

Quando se conhece o ambiente cultural dos velhos centros scientificos da Europa ou dos mais recentes, como os Estados Unidos, fica-se surprehendido com a invulgar capacidade do moço que sem desanimo e movido por alto enthusiasmo, jamais desalentou em fazer Sciencia em meios como os da America do Sul, onde sem duvida tambem se desenvolve, embora, atravez, de difficuldades e obstaculos que os europeus, norte-americanos e japonezes siquer suspeitam.

Incontestavelmente, entre nós já existe outro ambiente e a importancia que as pesquisas scientificas devem merecer, aos poucos vae sendo comprehendida e se incorporando á mentalidade da nova gente. Isto, porém, devido sobretudo aos esforços e sacrificios de scientistas devotados que procuram abrir caminho por entre uma cerração constante e muitas vezes luctando com a incomprehensão dos proprios detentores do podêr.

Hoje, que o nome de Lauro Travassos faz parte do melhor do patrimonio scientifico nacional, ha um prazer em rememorar o passado fazendo justiça aos que iniciaram em nosso meio as pesquisas relativas á Helmintholologia, campo em que o nosso homenageado tanto elevou o seu nome e exaltou o do Brasil.

Certa vez, ha muitos annos, na velha Escola de Medicina da Bahia, constituiu-se um luminoso centro que attrahiu a attenção dos scientistas do Velho Mundo.

Quando Dubini, em 1843, denunciou entre trabalhadores do tunnel de S. Gothardo, um verme occasionador de um mal que os dessorava e que reduzia a quasi nada a capacidade de trabalho, foi na Bahia que Wucherer, em 1866, reforçava a observação do pesquisador europeu com a comprovação da existencia do mesmo mal em plagas americanas.

Dez annos depois, em 1876, Silva Araujo chamava a attenção para uma doença nova que atacava gente brasileira, occasionada por um verme pela primeira vez alli estudado para o qual creou um novo genero, e que hoje a sciencia registra assignalando o helmintho sob o nome de *Wuchereria bancrofti* (Cobbold, 1877).

Com estas pesquisas os factos se transmutaram. A velha Europa confirmou os trabalhos realisados no Brasil, e Manson teve de reconhecer as denominações que os pesquisadores bahianos deram aos helminthos que estudaram, antes do grande tropicalista.

Como componente daquelle grupo de pesquisadores, encontrava-se Pedro Severiano de Magalhães que, em 1887, escrevia sua primeira contribuição helminthologica e, embora fosse, pelas circumstancias, levado a applicar sua actividade em sectores outros da Medicina, nunca deixou de se interessar pela Helminthologia que aprendera e trabalhára, com os investigadores daquelle nucleo scientifico brasileiro. Eis, talvez, a explicação para as pesquisas helminthologicas realisadas muitos annos depois por P. S. de Magalhães aqui, no Rio de Janeiro, no intervallo de seus trabalhos costumeiros, feitas porém com rigor e precisão, denunciando, por exemplo, a presença de um parasito de aves domesticas quando descreve, em 1898, o *Hymenolepis carioca*, hoje verificado ser helmintho cosmopolita.

Raul Leitão da Cunha prestou significativa homenagem a este preclaro investigador, reunindo na Faculdade de Medicina do Rio de Janeiro, o que restava do material colligido por este pioneiro da pesquisa scientifica entre nós, e a quem R. Blanchard dedicou a *Dirofilaria magalhãesi*, parasito encontrado pelo scientista brasileiro no coração do homem. Este material foi devolvido por Blanchard em expressiva homenagem a P. S. de Magalhães, dentro de uma caixinha de ouro.

O notavel pesquisador teve vida atormentada até os ultimos mezes de uma existencia fecunda e com todos os precalços de pioneiro, luctando com a incomprehensão geral do meio, mas continuando a trabalhar sem desanimo.

Com a crescente importancia que a doença provocada por aquelle verme descoberto por Dubini, as pesquisas realisadas sobre o mal originaram, no Brasil, dois importantes trabalhos: um, da lavra de Adolpho Lutz, nome que constitue um marco, no desenvolvimento da Sciencia no Brasil.

Na monographia por elle apresentada em 1885, o extraordinario investigador patricio estudava o helmintho productor da « Hypoemia intertropical »,

e, ao mesmo tempo, registrava a presença de um outro cuja differença chegou a assignalar, e que por um pouco mais lhe caberia a prioridade do descobrimento, o *Necator americanus*, feito mais tarde por Stiles, e que de ha muito existia na America, porque as referencias de Piso, em 1618, denunciam a parasitose entre os nossos indios, talvez mesmo pelo proprio Gabriel Soares de Souza, em 1587, naquelle capitulo que se refere aos «... que comem terra para se matarem », quando escreve: « e põem-se a comer terra, cada dia uma pouca, até que vêm a definhar e inchar do rosto e olhos, e a morrer disso ».

Lutz, porém, tinha sido precedido por Alfredo Luz, competente e esforçado pesquisador que em 1875 publicou sob o mesmo titulo « Hypoemia intertropical », a these com que defendeu seu titulo ao doutoramento no Rio de Janeiro. Em 1882 o investigador bahiano publicou em Valença nova contribuição que intitulou « Nouvelles observations et experiences relatives à l'étude de la dochmiase ou ankylostomiase et son traitement ». Acabou, entretanto, abandonando as pesquisas para terminar seus dias, realisando durante annos trabalhos de rotina scientifica em laboratorio do governo destinado a investigações bromatologicas.

Quando Looss, em 1896, determinou o cyclo evolutivo do *Ancylostoma duodenale*, viu suas pesquisas confirmadas na Faculdade de Medicina do Rio de Janeiro onde Austregesilo realisou as notaveis experiencias que confirmaram as conclusões do grande pesquisador allemão. Acompanhado de Moysés Menezes e Gomes de Faria, repetiu-se no Rio de Janeiro o episodio occorrido havia annos na Bahia, com a descoberta do parasito.

Gomes de Faria, ainda estudante, foi attrahido por Manguinhos e Oswaldo Cruz immediatamente aproveitou tão competente elemento, encarregando-o das pesquisas dos vermes.

Quando, em 1907, Sambon descobre o *Schistosoma mansoni*, no anno seguinte a velha Faculdade de Medecina da Bahia, atravez dos trabalhos de Pirajá da Silva, reproduz os factos occorridos com o descobrimento muitos annos antes feito por Dubini, e o pesquisador bahiano demonstra a existencia da nova parasitose descoberta.

Apezar de todos os contratempos e vae-e-vens, graças aos esforços de pesquisadores enthusiastas, a Sciencia ia se desenvolvendo no Brasil.

Oswaldo Cruz dá o impulso maximo creando a Escola de Manguinhos. No terreno da helminthologia Gomes de Faria descobre novas especies, tendo tido uma dellas grande repercussão porque parasita animaes domesticos e é especie compolita — o *Ancylostoma brasiliensis* — verificado presente em numerosos paizes do mundo e suas larvas occasionando uma das affecções mais interessantes e que, durante muito tempo, desafiou a argucia dos scientistas, quando erraticamente parasita o homem produzindo a *larva migrans*.

Foi em Manguinhos que Lauro Travassos, trabalhando com Gomes de

Faria, encontrou o seu primeiro orientador e mestre no campo que mais tarde tanto se notabilisou.

Em 1913, Travassos fazia com Gomes de Faria sua primeira contribuição no terreno da Parasitologia, quando estudou a presença de um arthropodo, a *Linguatula serrata,* no intestino do homem no Brasil. Neste mesmo anno defendia seu titulo de medico com a these que apresentou, intitulada «Sobre as especies brazileiras da subfamilia *Heterakinae*».

Dahi por deante, as contribuições se succedem em numero e importancia crescentes. Tive mesmo, em 1914, opportunidade de fazer um trabalho de Parasitologia em conjuncto com Marques da Cunha e Travassos, occupando-se este da parte helminthologica, e do homenageado de agora me recordo, quando estudante ainda, inscrevera-se como alumno do Curso de Manguinhos, occasião em que tive a honra, hoje o posso dizer, de contal-o entre os presentes ao curso, em que leccionei.

Seus companheiros de Manguinhos e discipulos desta casa e de outros pontos do Brasil, scientistas do mundo inteiro, trazem sua collaboração á homenagem que um grupo de moços quer render a Travassos e que tem especial significação sobretudo, neste momento, quando a cultura entra numa phase critica, talvez não sómente entre nós.

A convite de Fuelleborn, um dos continuadores de Looss, foi Lauro Travassos trabalhar em Hamburgo. Alli o pesquisador brasileiro teve opportunidade de estudar material europeu, podendo esclarecer muitos pontos duvidosos na systematica helminthologica e descrever novas especies em pesquisas, que durante mezes, realisou no Instituto de Medicina Tropical daquella cidade.

Em São Paulo, onde foi professor de Parasitologia, em substituição a Celestino Bourroul que succedera a Brumpt, o notavel parasitologista francez, Travassos não sómente imprimiu cunho verdadeiramente pratico ás suas aulas, como suscitou entre seus jovens discipulos novos pesquisadores da helminthologia.

Este é um dos principaes traços do scientista brasileiro: a faculdade de fazer escola e crear discipulos. Neste particular, ninguem o excede em nosso meio, onde ha necessidade de um devotamento excepcional para se consagrar aos trabalhos da Sciencia, a tal ponto que o exemplo vae ainda galvanisar pendores entre os discipulos, hoje numerosos, que saberão continuar a obra de tão conspicuo Mestre.

O exemplo de desprendimento pessoal e de desinteresse que o notavel investigador da Escola de Manguinhos dá, é qualquer coisa de consolador para os que amam as investigações scientificas, entre nós padecedoras de intermittencias. Para mim este traço é dos que mais me impressionam na figura do emerito helminthologista; a gloria de representar, sem saber, o papel da pedra

de amolar, que, embora se gastando, afia o gume dos conhecimentos alheios. mas que se paga pela alegria de vêr que entre os seus discipulos, alguns tiram até chispa e luz da pedra que devotadamente afiando, se consome.

Certa vez, um dos expoentes culturaes de nosso Paiz, Miguel Ozorio de Almeida, affirmou uma grande verdade ao escrever que a lingua que falamos não é obice á divulgação das nossas idéas, porém a ausencia de pensamento por parte dos escriptores é que a torna obscura e anonyma.

Lauro Travassos deu brilhante demonstração a tal acertiva, porque escrevendo no idioma ignorado, levou-o por todos os recantos do Universo, obrigando a investigadores de povos os mais differentes a lêr os resultados das suas pesquisas.

Os estudos de Helminthologia que realisou no Paiz, de tal forma remodelaram a systematica, que forçou a leitura da lingua desconhecida e investigadores de todos os centros scientificos do mundo, tiveram de levar em consideração o enorme acervo de conhecimentos que as investigações de Travassos trouxeram para o campo da helminthologia. E como em Sciencia, mais que em qualquer outro sector, a interdependencia dos phenomenos se realisa, Manguinhos viu chegar material da fauna helminthologica da Allemanha, Italia, Estados Unidos, Argentina, França, Portugal, para que o emerito scientista opinasse e decidisse sobre assumptos da especialidade que tão profundamente domina.

A Helminthologia tem em Lauro Travassos o seu maior investigador na America do Sul, onde encontrou um campo immenso para pesquisar, como é o Brasil. Para estudal-o atirou-se com enthusiasmo inquebrantavel e uma capacidade de trabalho inexcedivel a este campo de immensas possibilidades. Seu exemplo suscitou entre os jovens que o procuravam, curiosidade pela solução dos problemas da systematica e biologia dos helminthos e lhes transmittiu o enthusiasmo e estimulo que recebera de Oswaldo Cruz, o Mestre, o fundador da gloriosa Escola de Manguinhos, por quem Travassos foi tocado quando Oswaldo Cruz, no inicio da carreira scientifica do emerito investigador de que ora me occupo, orientava seus passos, levando-o a estudar problemas outros, como o tetano, de cujas pesquisas durante muitos annos foi encarregado.

Para descansar na semana de 9 dias que inventou, afim de não ficar em atrazo com o immenso que tem a estudar e a realisar, descansa como faz o nadador, mudando de nado, e então, estuda as brocas das madeiras, certo grupo de lepidopteros e faz excursões em busca de mais material, para as novas pesquisas e investigações que não darão mais brilho ao seu nome, mas servirão para os moços como alto exemplo de desprendimento, desinteresse material e espirito de sacrificio, em que não serve tão sómente ao Brasil, ao qual tem prestado os mais relevantes serviços, mas tambem á causa do desenvolvimento da propria Sciencia.

Lista dos trabalhos publicados pelo Prof. Lauro Travassos *

(1913 — 1937)

— 1913 —

1 (1). Nota sobre a presença da larva de *Linguatula serrata* Froelich (1789) no intestino do homem, no Brazil. Brazil-Medico, **27** (4) : 31, 1 fig. Em collaboração com J. Gomes de Faria.

2 (2). Nota sobre a presença da larva de *Linguatula serrata* Froelich no intestino do homem, no Brazil, seguida de notas sobre os linguatulideos da collecção do Instituto. Mem. Inst. Oswaldo Cruz, **5** (2) : 123-128, est. 11, 1 fig. (em port. e allem.). Em collaboração com J. Gomes de Faria.

3 (3). Sobre as especies brazileiras da sub-familia *Heterakinae*. These de doutoramento apresentada á Faculdade de Medicina do Rio de Janeiro, 41 pp., 5 ests., 38 figs., 3 proposições sobre cada cadeira do curso medico. Rio de Janeiro.

4 (4). Contribuições para o conhecimento da fauna helminthologica brasileira. I: *Gigantorhynchus aurae* n. sp. Mem. Inst. Oswaldo Cruz, **5** (3) : 252-255, 1 fig. texto (em port. e allem.).

5 (5). Sobre as especies brasileiras da subfamilia *Heterakinae* Railliet & Henry. Mem. Inst. Oswaldo Cruz, **5** (3) : 271-318, ests. 27-31, figs. 1-38 (em port. e allem.).

— 1914 —

6 (6). *Trichostrongylinae* brazileiras (Nota prévia). Brazil-Medico, **28** (17) : 163.

7 (7). *Trichostrongylinae* brazileiras. *Haemonchus similis* n. sp. (2.ª Nota prévia). Brazil-Medico, **28** (19) : 183.

8 (8). Morphologia, systematica e biologia dos Ancylostomos. Arch. Brasil. Med., **4** : 3-26; 193-205, 1 fig. texto, ests. 1-8, figs. 1-30. Em collaboração com J. Gomes de Faria.

9 (9). Trichostrongylideos brazileiros (3.ª Nota prévia). Brazil-Medico, **28** (34) : 325-327.

10 (10). Contribuição para o conhecimento da fauna helmintolojica brazileira. III. Novo genero da familia *Heterakidae* Railliet & Henry. Mem. Inst. Oswaldo Cruz, **6** (2) : 137-142, est. 15, 3 figs. (em port. e ingl.).

11 (11). Sobre as especies brazileiras do genero *Capillaria* Zeder, 1800 (Nota prévia). Brazil-Medico, **28** (17) : 129.

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* O numero entre parenthesis se refere a uma lista anteriormente existente, que a actual rectifica. Foi respeitada a graphia do autor.

12 (12). Contribuição para o conhecimento da fauna helmintolojica brazileira. IV. Sobre as especies brazileiras do genero *Tetrameres* Creplin, 1846. Mem. Inst. Oswaldo Cruz, **6** (3) : 150-162, ests. 16-23, 21 figs. (em port. e allem.).
13 (13). Contribuições parazitolojicas. I. Mem. Inst. Oswaldo Cruz, **6** (3) : 180-191, ests. 25-26, 5 figs. (em port. e allem.). Em collaboração com Arthur Neiva e Aristides Marques da Cunha.

— 1915 —

14 (14). *Uncinaria carinii* n. sp. (Nota prévia). Brazil-Medico, **29** (10) : 73.
15 (17). Da presença do cysto hydatico no Rio de Janeiro. Brazil-Medico, **29** (13) : 970. Em collaboração com Oscar d'Utra e Silva.
16 (16). Informações sobre os helmintes parasitos do homem encontrados no Brazil. These de livre docencia Faculdade de Medicina, 33 pp., Rio de Janeiro.
17 (15). Revisão dos Acantocefalos brazileiros. I. Fam. *Gigantorhynchidae* Hamann, 1892 (Nota prévia). Brazil-Medico, **29** (12) : 89. Republicado em: Ibid., **29** (14) : 105.
18 (18). Revisão dos Acantocefalos brazileiros. I. Fam. *Gigantorhynchidae* Hamann, 1892 (2.ª nota prévia). Brazil-Medico. **29** (18) : 137.
19 (19). Sobre as especies brazileiras do genero *Tetrameres* Creplin, 1846 (Nota prévia). Brazil-Medico, **29** (38) : 297-298.
20 (20). Revisão dos Acanthocephalos brazileiros. II. Fam. *Echinorhynchidae* Hamann, 1892 (Nota prévia). Brazil-Medico, **29** (48) : 377.
21 (21). Trichostrongylideos brazileiros (1.ª nota prévia). Brazil-Medico, **29** (49) : 388-389.
22 (22). *Acheilostoma paranecator* n. sp., novo nematoide parasito de *Equus asinus*. Brazil-Medico, **29** (49) : 389. Em collaboração com Paulo de F. Parreiras Horta.
23 (24). Contribuições para o conhecimento da fauna helmintolojica brasileira V. Sobre as especies brasileiras do genero *Capillaria* Zeder, 1800. Mem Inst. Oswaldo Cruz, **7** (2) : 146-172. ests. 23-26, 11 figs.

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24 (23). Informações sobre a fauna helminthologica sul-fluminense. Brazil-Medico, **30** (1) : 1-2.
25 (25). Trematodeos novos. Brazil-Medico, **30** (33) : 257-258.
26 (26). Informações sobre a fauna helminthologica sul-fluminense. II. Brazil-Medico, **30** (40) : 313-314.

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27 (27). Especies brazileiras do genero *Lyperosomum* Looss, 1899. Primeira Conf. Sud-Amer. Hyg., Microb. y Patol., 17/24 Sept. 1916, pp. 737-745, figs. 1-6.
28 (28). *Gigantorhynchidae* brasileiras. Congresso Medico Paulista, **5** (2) : 181-191.

29 (29). Nematodeos parasitos de roedores. Brazil-Medico, **31** (3) : 35.
30 (30). *Tetrameridae* brazileiras (2.ª Nota prévia). Brazil-Medico, **31** (8) : 65-66.
31 (31). Trichostrongylinas brazileiras (5.ª nota prévia) Brazil-Medico, **31** (9) : 73.
32 (33). Principaes helminthoses observadas no gado de córte do Brasil. 1.ª Conferencia Nacional de Pecuaria, 4 pp., Rio de Janeiro.
33 (34). Alguns helminthos da collecção do Instituto Bacteriologico de S. Paulo. Brazil-Medico, **31** (12) : 99-100.
34 (35). Helminthos da collecção do Museu Paulista. Brazil-Medico, **31** (15) : 121-122.
35 (36). Contribuição para o conhecimento da fauna helminthologica Sul-Fluminense. III. Brazil-Medico, **31** (18) : 149.
36 (42). Contribuições para o conhecimento da fauna helminthologica brasileira. VI. Revisão dos Acanthocephalos brasileiros. Parte I. Fam. *Gigantorhynchidae* Hamann, 1892. Mem. Inst. Oswaldo Cruz, **9** (1) : 5-62. ests. 1-24 A, figs. 1-148.
37 (47). Informações sobre um interessante parasito dos gatos — *Chlamydonema preputialis* (v. Linstow, 1888). Arch. Esc. Sup. Agric. Med. Vet., **1** (2) : 101-103, figs. 1-2.

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38 (37). Novo typo de *Philophtalmidae*. Rev. Soc. Brasil. Sci., **2** : 75-77, **1** fig.
39 (41). Pesquizas sobre as *Gigantorhynchidae*. Rev. Soc. Brasil. Sci., **2** : 79-81.
40 (38). Informações sobre a familia *Kathlanidae*, n. nom. Rev. Soc. Brasil. Sci., **2** : 83-88, figs. 1-6.
41 (40). Sobre um exemplar macho de *Oxyuris equi* (Schrank, 1788). Rev. Soc. Brasil Sci., **2** : 89-91.
42 (39). Observações sobre os *Heterakidae*. Rev. Soc. Brasil. Sci., **2** : 93-97, figs. 1-2.
43 (46). Helminthes parasitos de animaes domesticos. I. Rev. Vet. & Zoot., **8** (1) : 3-15, figs. 1-6
44 (48). Contribuição para o conhecimento da fauna helminthologica Sul-Fluminense. IV. Brazil-Medico, **32** (37) : 289-290.
45 (53). Contribuições para o conhecimento da fauna helminthologica brasileira. VII. Especies brasileiras do genero *Thelazia* Bosc, 1819. Rev. Mus. Paulista, **10** : 215-230, figs. 1-13.

— **1919** —

46 (32). Gastro helmintose das aves domesticas. Rev. Vet & Zoot., **9** (2) : 79-89, figs. 1-9 (Apresentado á 1.ª Conf. Nac. de Pecuaria, Maio de 1917).
47 (60). Informações sobre o material helminthologico colleccionado na Ilha da Trindade em 1916. Arch. Mus. Nac. Rio de Janeiro, **22** : 161-167, figs. 1-7.
48 (61). Contribuições para o conhecimento da fauna helminthologica brasileira. VIII. Sobre as especies brasileiras do genero *Tetrameres* Creplin, 1845. Mem. Inst. Oswaldo Cruz, **11** (1) : 71-79, ests. 25-28, figs. 1-14 (em port. e franc.).

49 (63). Contribuição para a sistematica dos *Dicrococlinae* Looss, 1899. Arch. Esc. Sup. Agric. Med. Vet., **3** (1/2) : 7-24, figs. 1-14.

— **1920** —

50 (49). Novo tipo de *Telorchinae*. Rev. Soc. Brasil. Sci., **3** : 183-187, fig. 1.
51 (50). *Filaria carinii* n. sp. Rev. Soc. Brasil. Sci., **3** : 188-189, figs. 2-3.
52 (51). *Trichostrongylidae* brazileiros. Rev. Soc. Brasil. Sci., **3** : 191-205.
53 (45). Helmintes parasitos do homem encontrados no Brasil. Rev. Soc. Brasil. Sci., **3** : 207-208.
54 (44). Um novo typo de Acantocefalo. Rev. Soc. Brasil. Sci., **3** : 209-215, 1 graph.
55 (43). (Nota sobre *Gigantorhynchidae*). Rev. Soc. Brasil. Sci., **3** : 235.
56 (54). Contribuição para a sistematica das *Physalopterinae*. Rev. Sci., **4** (2) : 57-58.
57 (64). Acanthocephalos dos animaes domesticos. Rev. Vet. & Zoot., **10** (1) : 3-23, figs. 1-29.
58 (56). Genero *Florencioia* Trav., 1919. Arch. Esc. Sup. Agric. Med. Vet., **4** (1) : 21-24, ests. 7-9, 6 figs. Republicado na Rev. Sci., **4** (4/6) : 137-139, figs. 1-6.
59 (57). Contribuição para a sistematica dos Ascaroidea. Arch. Esc. Sup. Agric. Med. Vet., **4** (1) : 15. Republicado na Rev. Sci., **4** (3) : 92.
60 (58). Contribuições para o conhecimento da fauna helminthologica brasileira. Arch Esc. Sup. Agric. Med. Vet., **4** (1) : 17-20, ests. 2-6, 8 figs.
61 (55). Esboço de uma chave geral dos Nematodeos parasitos. Rev. Vet. & Zoot., **10** (2) : 59-70, 1 quadro.
62 (65). Contribuições para o conhecimento da fauna helminthologica brasileira. IX. Sobre as especies do genero *Spinicauda* n. g. Mem. Inst. Oswaldo Cruz, **12** (1) : 44-50, est. 8-10. figs. 1-10.
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Observations on the mechanism of phagocytosis of various helminth ova

Candido M. Africa and Walfrido de Leon

Department of Parasitology and Department of Sanitary Bacteriology and Immunology, School of Hygiene and Public Health, University of the Philippines

[With 5 plates]

The eggs of various species of parasitic helminths have been known to occur in the tissues of various vertebrate hosts. Notable among these in the human host may be mentioned the three human blood flukes (*Schistosoma hematobium*, *S. mansoni* and *S. japonicum*) and *Paragonimus westermanni*. More recently the eggs of various species of heterophyid trematodes have been encountered associated with definite lesions in the heart and cerebro-spinal system of man (Africa et al., 1935 a and b; 1936 a, b; 1937) in the Far East. Monserrat and Africa (1923) found *Ascaris* eggs in the early stages of embryonal development in the liver tissue of a child; and Yamauchi (1921) encountered the eggs of the same worm in about the same stages of development in the wall of the duodenum of the same host. And only last year embryonated eggs of *Ascaris* were encountered in similar nodules in the mesentery of an old woman with a heavy infestation of this worm (Africa and Garcia, 1936 a).

At present authorities are apparently satisfied as to the ultimate fate of helminth eggs that happen to be incarcerated in the tissues of the various organs of the host. It is generally believed that they are either destroyed and phagocytosed by the so-called foreign-body giant-cells, or are killed or entombed by the fibrotic tissues and eventually calcified if the host survive the infestation. This view, however, has been apparently based on mere observations made during occasional studies of histological sections of naturally infested tissues. The mechanism by means of which these helminth ova are destroyed and removed by these scavenger giant-cells has not been systematically studied at least under experimental conditions. Hence the present morphological study on the mechanism of phagocytosis of various helminth ova by foreign-body giant-cells mostly in tissues experimentally infested.

MATERIALS AND METHOD

The materials used in this study consist chiefly of serial histological sections stained with hematoxylin and eosin of experimentally produced nodules or egg-tubercles in the mesentery and omentum of monkeys (*Maccacus cynomolgus*). The eggs of the particular worm elected for study would be found enmeshed in the reactive tissue of such nodules and many of them attacked by foreign-body giant-cells. In this paper observations will be confined as much as possible to the mechanism of phagocytic action of these giant-cells against

the eggs under consideration. As to the probable nature and origin of these giant phagocytes the reader is referred to McCallum's (1932) Textbook of Pathology.

For the technique of inducing the formation of egg-tubercles in the mesentery and omentum of monkeys the reader is referred to a previous publication by Africa and Garcia (1936 b) in which they showed that if huge doses of eggs of *Ascaris* are introduced into the peritoneal cavity of this animal, they are rapidly pocketed by the peritoneum of the mesentery and omentum as foreign-bodies, and in these localities they excite the formation of pseudotubercles where they become the center of cellular and phagocytic reaction. This is, to the mind of the authors, an excellent way of studying the mechanism of phagocytosis, not only of helminth ova, but also of other foreign-bodies planted in the tissue, for two principal reasons, viz., (1) the objects desired to be studied can be located with great precision whenever desired, (2) the progress of phagocytosis can be observed step by step at the will of the experimenter, provided a large number of animals are available until the eggs eventually disappear from the scene. For instance, in our experiment involving *Ascaris* eggs, the giant-cells were found to make their appearance in the nodules as early as the fourth day after intraperitoneal inoculation of eggs, and the nodules became almost free from traces or remnants of eggs in a monkey that died six months after inoculation. These alone constitute a distinct advantage over the usual method of studying the phagocytosis of eggs by mere examination of histological sections of naturally infested tissues haphazardly obtained at the autopsy table. In this study, however, serial sections obtained from naturally infested tissues of human cases have been also studied to supplement our experimental observations.

In this work observations on the mechanism of phagocytosis have been made on the ova of *Ascaris lumbricoides* and heterophyid eggs both in naturally infested tissues and in experimentally produced egg-tubercles; on the ova of *Fasciola gigantica* in experimentally produced nodules alone; and on the eggs of *S. japonicum* in naturally infested human tissues alone.

To rule out the possibility of tuberculous lesions interfering with our observations, acid fast staining is resorted to whenever we are in doubt.

MECHANISM OF PHAGOCYTOSIS OF:

Ascaris Eggs. — Africa and Garcia (1936 b) have shown that if fertilized unincubated eggs of *Ascaris lumbricoides* are kept sufficiently long in the mesentery and omentum of monkeys, they can undergo development in these organs as if they were in a culture medium. Histological sections of artificially produced egg-tubercles taken from these localities twenty-six days after intraperitoneal inoculation show a large number of embryonated eggs together with others that lag behind in embryonal development. Figuring prominently among the cellular constituents of this mass of newly formed tissue are numerous giant-cells drawn to the locality by the presence of the eggs which the former attack avidly. Intraperitoneal inoculation of previously incubated embryonated eggs produces the same histopathological picture. This histopathological picture is quite identical to that observed by the same authors (1936 a) in sections of naturally formed nodules involving the same egg in the mesentery of a human

case previously alluded to. In this study these, human and monkey materials have been made available together with new materials obtained by further experimentation.

Extensive serial study of histological sections obtained from such nodules above described has enabled us to present the following observations on the probable mechanism of phagocytosis of *Ascaris* eggs:

A general panoramic view of a section of an egg-tubercle will reveal a large number of eggs at various stages of embryonal development scattered here and there among the reactive tissue cells (Plate 1, Fig. 1). Some eggs are badly distorted or crinkled, others ruptured or broken, while still others have their shell so thinned that it appears just a faint line, which, nevertheless, still preserves the normal contour of the eggs. The most striking feature of the histological picture, however, are the large number of giant-cells specially numerous wherever the eggs happen to congregate. That the fibrotic process assists in twisting or disrupting the ova is very evident. The giant-cells, however, are seldom if ever, found dipping their cytoplasmic «arms» or invading the interior of disrupted or broken eggs as what appears to be the case in the phagocytosis of *Fasciola* and *Schistosoma* eggs as will be demonstrated subsequently. Although a giant-cell or, more frequently, what appears to be several of them that have fused together, may be found wrapped around an egg or eggs, there seems to be no attempt on the part of the phagocytes to make an opening on or break the egg-shells forcibly. A rather common sight is a whole egg, or more rarely, two or more eggs (Plate 1, Fig. 2) engulfed completely within the cytoplasm of a giant-cell, and this is more commonly observed among embryonated ones than among those that have not yet reached this stage of development, as if the larval content provides stronger attraction for these phagocytes. Often a phagocytosed egg with its shell reduced to a mere shadow or faint line is seen; at other times a naked apparently living larva together with fragments of what appear to be remnants of egg-shell are found enmeshed in the cytoplasm of the phagocyte (Plate 1, Fig. 4); and still at other times mere fragments of a larva are seen, giving the impression that they are being slowly churned and digested in the cytoplasm of the giant-cell (Plate 2, Fig. 1). The last picture perhaps represents the last stages of phagocytosis of an *Ascaris* egg whereupon it is completely eliminated from the scene. It is noted that the giant-cell appears healthy and well-fed as shown by its clearly stained multiform clearly vesicular nuclei with clear karyosomes and the large number of vacuoles appearing in the cytoplasm.

That these giant-cells are possessed of a kind of digestive ferment has been pointed out by Metchnikoff (Cited by McCallum, 1932). He calls it macrocytase. It seems from the above observations that this ferment acts so rapidly upon the shell of *Ascaris* eggs that it melts away under its influence before the pressure or force exerted by the cytoplasm of the phagocyte upon the egg-shell could break it; or the giant-cell, perhaps, finds it unnecessary to apply force since the egg-shell can be so easily digested. If this is factual, it would explain the apparent absence of giant-cells actually causing ruptures or openings on the egg-shell to effect entrance.

The giant-cells are noted to be present already in the lesion as early as the fourth day after intraperitoneal inoculation. In nodules obtained two months and 11 days after inoculation, the egg-tubercles are for the most part filled with

a large number of very well-nourished giant-cells (Plate 2, Fig. 3), a few of them still showing remnants of eggs or larvae; while in nodules obtained from a monkey that died about six months after inoculation, only a few giant-cells loitering lazily are left around the place where eggs were presumably located before (Plate 2. Fig. 4). That these giant-cells after disposing of the eggs do not leave the locality but die there and disintegrate is indicated by the large number of broken down phagocytes found in these localities as revealed by their scattered nuclei that are also in the process of breaking down. That these battleground between the phagocytes and the eggs will soon be replaced by fibrotic tissues is evident from the advancing fibrosis from the periphery of the pseudotubercles.

Fasciola gigantica eggs. — Before proceeding it is well to remember that the eggs of *F. gigantica* are very large, being around 160 to 190 microns in length by 70 to 90 microns in breadth; that the relative thin but apparently chitinous egg-shell is operculate; and that embryonal development naturally takes place in water. The eggs of this fluke have never been reported in the tissues of any vertebrate host. In this work the eggs used for intraperitoneal inoculation were obtained from the gall bladder of infested cattle and hence only in the initial stages of embryonal development. Contrary to what has been observed in the case of *Ascaris* eggs no embryonal development was observed in any of the eggs found in experimentally produced nodules; in fact degeneration of the egg contents was observed in all the eggs that have escaped so far destrnction by phagocytosis or fibrotic reaction.

As can be seen in the low power photomicrograph (Plate 3, Fig. 1) of a section of the interior of a typical nodule, the general histological picture is quite identical to what has been observed in *Ascaris* nodules. Even a casual glance, however, will at once reveal that the manner in which the foreign-body giant-cells attack the eggs varies somewhat from that adopted by the phagocytes in disposing *Ascaris* eggs. Here we have failed to find even a single instance in which a whole egg is contained completely within the cytoplasm of the phagocyte. That this has not been due to the large size of the eggs is evident from the fact that in *Ascaris* egg-tubercles as many as three eggs have been found inside one giant-cell or what appears to be several giant-cells that have fused together. On the other hand, giant-cells actually making openings in the egg-shell to invade the interior, or else hugging and crumpling the eggs within their apparently powerful «arms» eventually reducing them into shreds which they later on devour avidly, appear to be a common picture here. A vivid account of the probable mechanism of phagocytosis of *Fasciola* eggs by giant-cells may be better obtained by describing individually several scenes in a histological section each of which depicting a phagocyte at work at the time tissue was preserved for sectioning, as follows:

In Plate 3, Fig. 2, under the high power will be seen a giant-cell battering the side of an egg. As can be noticed in this picture the phagocyte has pushed a portion of the egg-shell at the point where the nuclear force has concentrated forming a sort of invagination which the phagocyte has occupied. In this particular case the egg-shell has not yet given way, but it is not at all hard to guess what will follow for a little more pushing by the phagocyte plus the eroding effect of its digestive ferment would very likely cause the rupture of the shell at this point. Once a hole is made the phagocyte flows into the interior of the egg engulfing and digesting whatever material comes on

its way. Soon an enormously large giant-cell with a large number of nuclei and vacuolated cytoplasm, and looking well-fed and well-nourished, completely fills up the interior of the egg, as shown in Fig. 3, Plate 3. In this photomicrograph fragments of egg-shell (most likely that portion pushed and detached at the point of entry) as well as debris of the egg-contents can be seen caught in the cytoplasm of the phagocyte. That at times, although perhaps by chance and not on account of any form of taxis, the giant-cell may invade the interior of an egg through its natural opening, the operculum, is evident from Plate 3, Fig. 4. The phagocyte that has succeeded in entering the interior of the egg and stuffed itself with foreign material apparently grows in bulk and expands thus cracking the containing egg-shell into fragments as shown in Plate 4, Fig. 1. Once this is accomplished the rest is easy. The cytoplasmic arms of the phagocyte now reach towards different directions for these fragments of egg-shell, which once caught in the body of the phagocyte again, are drawn centripetally and slowly churned and digested until not a trace of the egg is left. On the other hand a giant-cell may phagocytose an egg without invading its interior. Plate 4, Fig. 3, shows a huge phagocyte that has wrapped itself around an empty egg and hugged it so forcibly that the sides of the egg have collapsed. Serial study of this particular section has revealed a continuous sheet of protoplasm thrown around the egg completely encircling it. This seems to be a demonstration of force centripetally applied, in contrast with the above procedure in which the force that breaks the egg-shell is directed from within. The eventual fate of this empty egg can be predicted from the appearance of this picture. Plate 4, Fig. 2, shows a huge giant-cell acting like a steam roller upon an empty egg. The pictures just described do not represent isolated cases. They are common sights in histological sections prepared from our artificially produced egg-tubercles.

Schistosoma japonicum eggs. — The material used in this part of our study came from two sources: (1) A piece of the thickened intestine and a few enlarged glands were obtained during a caecostomy operation on a case diagnosed as cancer of the intestine. On histological examination many *Schistosoma* eggs were found buried in the glandular tissues. This case has provided us with a very excellent material for the morphological study of the various procedures displayed by the giant-cells in the phagocytosis of *Schistosoma* eggs. (2) Some more material was obtained from an autopsy case with anatomical diagnosis of cirrhosis of the liver, ulcerative colitis, mesenteric lymphadenitis and multiple postules and intramuscular abscesses in the upper and lower extremities. Histological sections of the liver, lungs, intestinal wall and heart showed innumerable number of *Schistosoma* eggs specially in the first three organs. Beautiful histological preparations from the heart of this case have likewise afforded us with excellent material for study. At this juncture we might mention that it has been our experience that wherever there are extraordinarily heavy infiltration of eggs in the tissue as was true of the liver, intestine and lungs of this case, giant-cells are generally scarce or absent altogether. We observed this quite often also in our experimentally infested tissues with *Ascaris* and *Fasciola*.

The procedure adopted by the giant-cell in the phagocytosis of *Schistosoma* eggs is somewhat analogous to that observed in the case of *Fasciola* eggs. The giant-cell breaks the egg shell by applying its entire bulk of cytoplasm

closely around the shell and then concentrating at one point its entire nuclear force in wedge-shaped formation in order to effect fracture of the shell at the point aimed at. After the opening is made the cytoplasm with some nuclei gradually creep inside and raid the miracidium which soon becomes indistinguishable in the giant-cell cytoplasm (Plate 5, Fig. 1). The egg-shell is finally broken into pieces apparently by the expansion of the giant-cell which has grown in bulk due to nourishment afforded by the foreign material it has ingested and digested. As a closing scene of this act we seem to see pieces of the shell gradually losing its clear transparency in the hyalinizing cytoplasm to be lost completely afterward.

Another method is apparently to apply pressure centripetally in all directions, as indicated by an almost uniform layer of nuclei around the egg, and let the shell break under this stress at its weakest point which usually takes place at the most pointed extremity of the shell. Through this opening the egg content is raided by the giant-cell cytoplasm and the shell disposed of as described above.

The third process seems to be accomplished in the following way: the giant-cell anchors itself by means of cytoplasmic projections at several convenient points in the surrounding fixed fibrous tissue stroma in the manner of the spider web and then simultaneously apply traction from all directions, causing rupture of the egg-shell at several points and the broken pieces of egg-shell drawn apart. This last picture, however, is not so frequently seen. Any one of these methods may be resorted to by the giant-cell either singly or in combination with other process until the egg-shell is fractured and the contents raided and disposed of.

Heterophyid eggs. — While making our observations on the manner by which the eggs of *Ascaris*, *Fasciola* and *Schistosoma* are phagocytosed by giant-cells, we reminiscened on the very negative or indifferent attitude of this phagocyte towards the eggs of various heterophyid flukes recently found in lesions in the heart, cerebro-spinal system and elsewhere in man (Africa, de Leon and Garcia, 1935 b; 1936 a, b; 1937). We recalled that we never encountered even a single foreign-body giant-cell in our examination of thousands of sections containing eggs of this group. We thought this rather strange in view of the fact that these eggs, many of which contain miracidium, if there would be any choice at all, would likely prove to be a more tempting morsel because of their relatively smaller size than other eggs. In all our sections from human cases, the eggs are invariably enmeshed in sheets of pure histiocytes and endotheliocytes in fibrous tissue stroma with an intermixture of red cells if the lesion is of recent formation. The histological picture is completely at variance with that of egg-tubercles involving other helminth eggs such as *Ascaris* or *Schistosoma* for example.

An extensive review of our human material this time again failed to disclose the presence of any foreign-body giant-cells in our sections. (See previous publications). We, therefore, inoculated washed eggs of *Monorchotrema taihokui* (obtained by macerating freshly recovered flukes from young pups) into the peritoneal cavity of a monkey. When the monkey was killed two weeks after the inoculation very tiny nodules were recovered from the omentum. Histological sections of these nodules show sheets of pure histiocytes and endotheliocytes in fibrous tissue stroma with eggs enmeshed in it here and there, a picture quite

identical to our findings in natural human infestations. There is not found even a single giant-cell in these sections. In fact we failed to find giant-cells until after whole flukes were used for the inoculation; but even in sections prepared in this experiment the phagocytes are scarce, and they do not seem to be attracted to the eggs but to the fragments of disentegrating flukes. Until other explanations become available to account for this very noticeable indifference of the giant-cells towards heterophyid eggs, we will interpret this finding as as example of negative chemotaxis.

COMMENTS

On the basis of our present findings we feel justified to offer the following tentative observations:

(1) The different procedures adopted by the foreign-body giant-cells in phagocytosing the helminth ova considered in this work appear to be due to the differences in size, structure and chemical composition between the different eggs, which perhaps determine the nature or character of the taxis that govern the behaviour of the giant-cells.

(2) It has been observed that giant-cells in *Ascaris* and *Fasciola* egg-tubercles are generally larger, with clearer and more ligthly stained cytoplasm than those found in *Schistosoma* egg-tubercles. Their nuclei are much more numerous, larger, more vesicular and with clearer karyosome than those of the phagocytes in *Schistosoma* lesions. In other words they appear more healthy looking, better nourished and more powerful than the giant-cells attacking *Schistosoma* eggs. The latter are as a rule smaller, with more compact and deeply staining cytoplasm, and smaller nuclei which seem to have lost their vesicular appearance giving the general impression of a more hardy and trying life. That these differences are due to the differences in the potency of the toxic substances excreted from the eggs is very likely.

(3) Embryonated *Ascaris* eggs seem to offer more attraction to the giant-cells than unembryonated ones.

(4) In the case of *Schistosoma* eggs phagocytosis seems to be more active in the lymphatic glands, liver and heart than in the intestinal wall where the tissue reaction consists mainly of diffuse infiltration of neutrophilic and eosinophilic leucocytes, hyperplasia of fibrous tissue and formation of thick hyalinized fibrotic capsules containing collections of eggs, and a few tubercles.

(5) A giant-cell probably never acted as a mere mechanical carrier of a phagocytosed object for transporting it for final disposition in a suitable organ as some authors claim. The phagocytes actually devour and digest their prey for nourishment. After successfully battling with and disposing of the foreign objects in the tissue to which they have been summoned, they probably do not leave the battle-ground anymore but stay there until they die of old age and disintegrate.

(6) It seems that the formation of giant-cells is a highly organized form of tissue reaction which is a fairly efficient method of local resistance.

(7) The complete indifference shown by the giant-cells toward heterophyid eggs seems to afford an interesting example of negative chemotaxis.



SUMMARY

Observations have been made on the mechanism of phagocytosis of various helminth ova both under experimental and natural conditions. The procedures adopted by the foreign-body giant-cells in phagocytosing these ova seem to vary in the different eggs according to their size, structure and chemical composition. It is believed that a new and better method of studying phagocytosis of foreign objects in the tissues is introduced in this paper.

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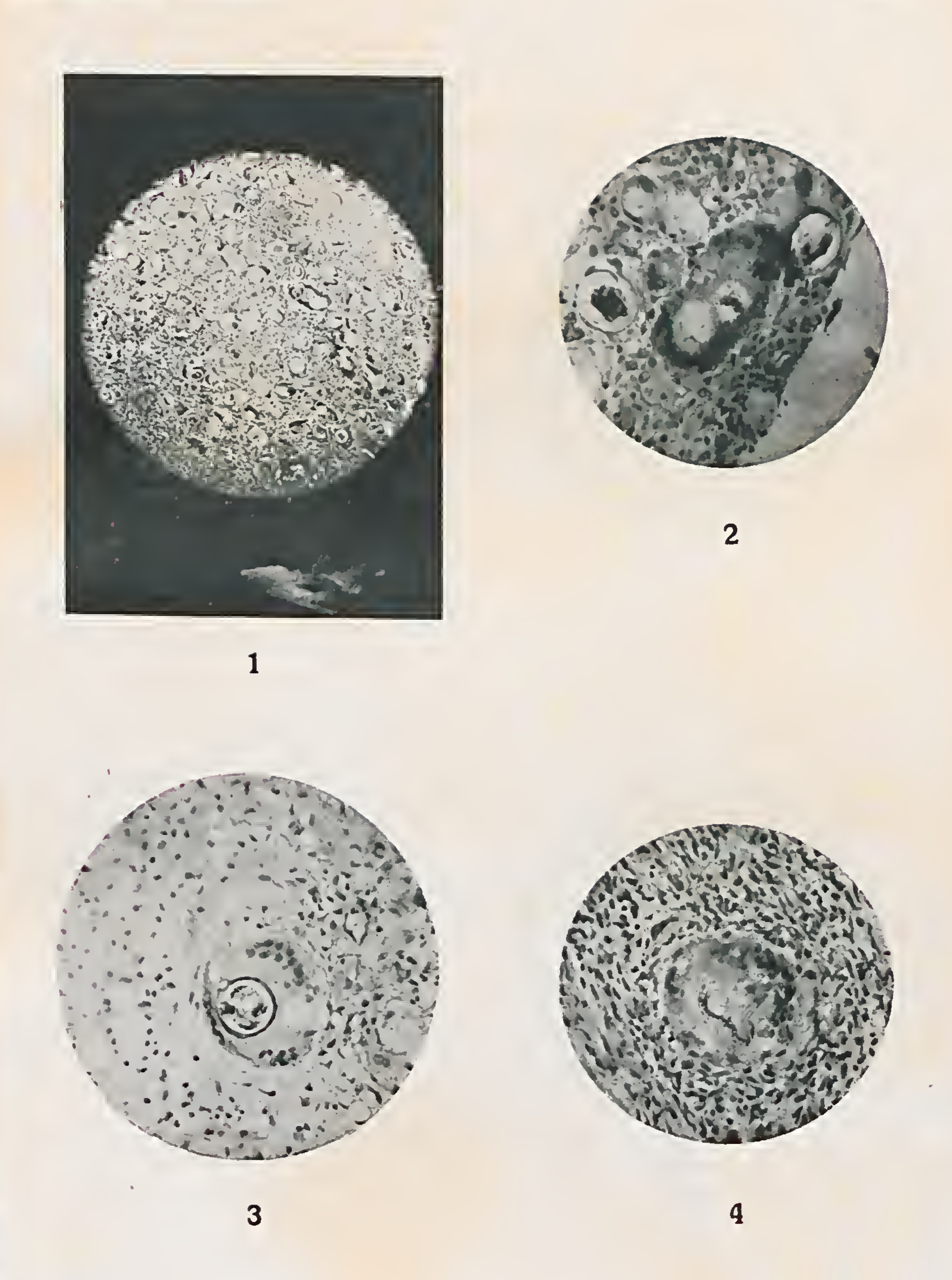
Plate 1

Fig. 1 — Photomicrograph, low power, of a histological section of a nodule from the mesentery of a human case showing *Ascaris* eggs in various stages of embryonal development and giant-cells.

Fig. 2 — A section of the same nodule under the high power showing two *Ascaris* eggs engulfed by a huge giant-cell or giant-cells whose cytoplasms have coalesced.

Fig. 3 — A section under the high power of an experimentally produced nodule in monkey showing a giant-cell containing in its cytoplasm an embryonated *Ascaris* egg.

Fig. 4 — Photomicrograph, high power, showing a naked *Ascaris* larva inside the cytoplasm of a giant-cell. Note the large number of clear vesicular nuclei with distinct karyosome and a piece of what appears to be the remnants of undigested portions of the egg-shell. (Experimental).



Africa & Leon: Mechanism of phagocytosis of various helminth ova.

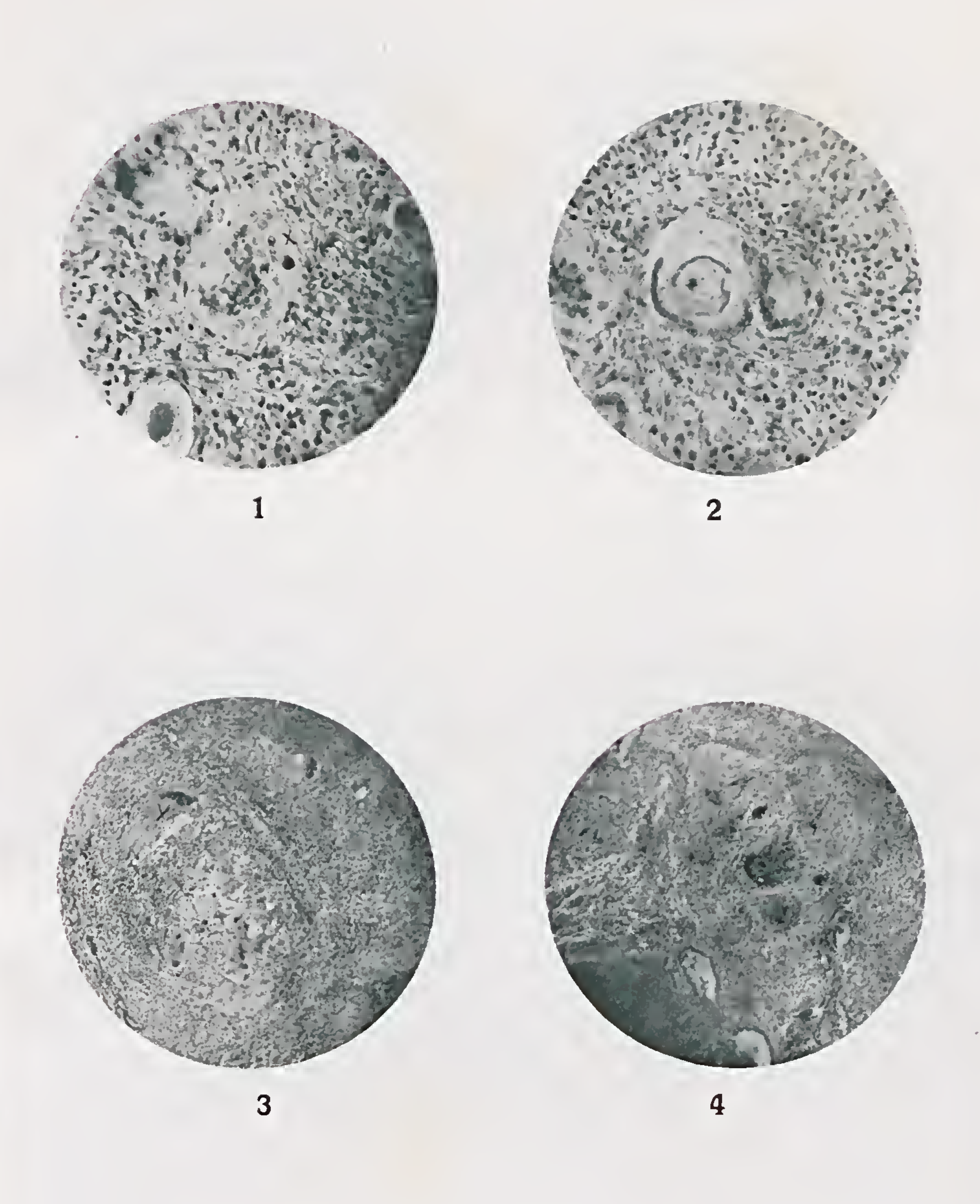
Plate 2

Fig. 1 — A giant-cell showing fragments of a decapsulated *Ascaris* larva (x) that appears to be gradually being churned and digested in the cytoplasm of the phagocyte. Note the vacuolated cytoplasm and again the large clearly vesicular nuclei with very distinct karyosome. (Experimental).

Fig. 2 — A giant-cell (high power) showing the cord-like arrangement of the nuclei thrown around the foreign-body. (Experimental).

Fig. 3 — Photomicrograph (low power) of a histological section of a two-month and fourteen-day old egg-tubercle showing a congregation of a large number of healthy looking well-nourished phagocytes. Note the almost complete absence of *Ascaris* eggs. Under the high power the giant-cell (y) with a large number of crowded nuclei at the edge of the tubercle will show fragments of a decapsulated *Ascaris* larva. (Experimental).

Fig. 4 — A section of a six-month old *Ascaris* egg-tubercle. Note the close similarity to a true tubercle. This had to be counter-stained for acid-fast organism to eliminate tuberculosis. Note the degenerating giant-cells. (Experimental).



Africa & Leon: Mechanism of phagocytosis of various helminth ova.

Plate 3

Fig. 1 — Photomicrograph (low power) showing a panoramic view of a 14-day old nodule (experimental) containing *Fasciola gigantica* eggs scattered in the spongy reactive tissue. Note the general manner of phagocytic action of the giant-cells. (Indicated by arrows).

Fig. 2 — A giant-cell battering the side of a *Fasciola* egg forcing an entrance. (High power, experimental).

Fig. 3 — A giant-cell that has broken through an opening and now raiding the contents of the egg. A piece of egg-shell (probably the opercular lid) can be seen in the cytoplasm of the phagocyte. (Experimental).

Fig. 4 — Another giant-cell raiding the interior of an egg. (Experimental).



Africa & Leon: Mechanism of phagocytosis of various helminth ova.

Plate 4

Fig. 1 — A very well-nourished and very much nucleated giant-cell that has cracked an egg-shell centrifugally. Note again the very clearly vesicular nuclei with distinct karyosome; also the vacuoles containing remnants of the egg-contents. A portion of the cytoplasm with its corresponding share of nuclei has flown around one fragment of egg-shell in a flanking movement evidently trying to incorporate it within the protoplasmic mass. Late stages of this procedure show fragments of egg-shell growing fainter and fainter until they completely disappear in the cytoplasm. This is a picture very commonly encountered in the pseudotubercle indicating that it is the favorite method adopted by the giant-cell in phagocytosing *Fasciola* eggs. (High power, experimental).

Fig. 2 — A giant-cell acting like a steam-roller upon an empty egg of *Fasciola*. (High power; experimental).

Fig. 3 — A giant-cell or giant-cells that have fused together hugging a *Fasciola* egg around the « waist line » pressing and constricting it until both « arms » meet. The ultimate fate of this egg is easy to read from this picture. (High power; experimental).

Fig. 4 — A *Schistosoma* egg-tubercle in the myocardium showing a large number of small but tough and hardy looking giant-cells. Under the high power the nuclei of these phagocytes are fewer, smaller, more compact and do not have the vesicular appearance of the nuclei of the giant-cells found in *Ascaris* or *Fasciola* egg tubercles. (Low power; natural human infestation).



Africa & Leon: Mechanism of phagocytosis of various helminth ova.

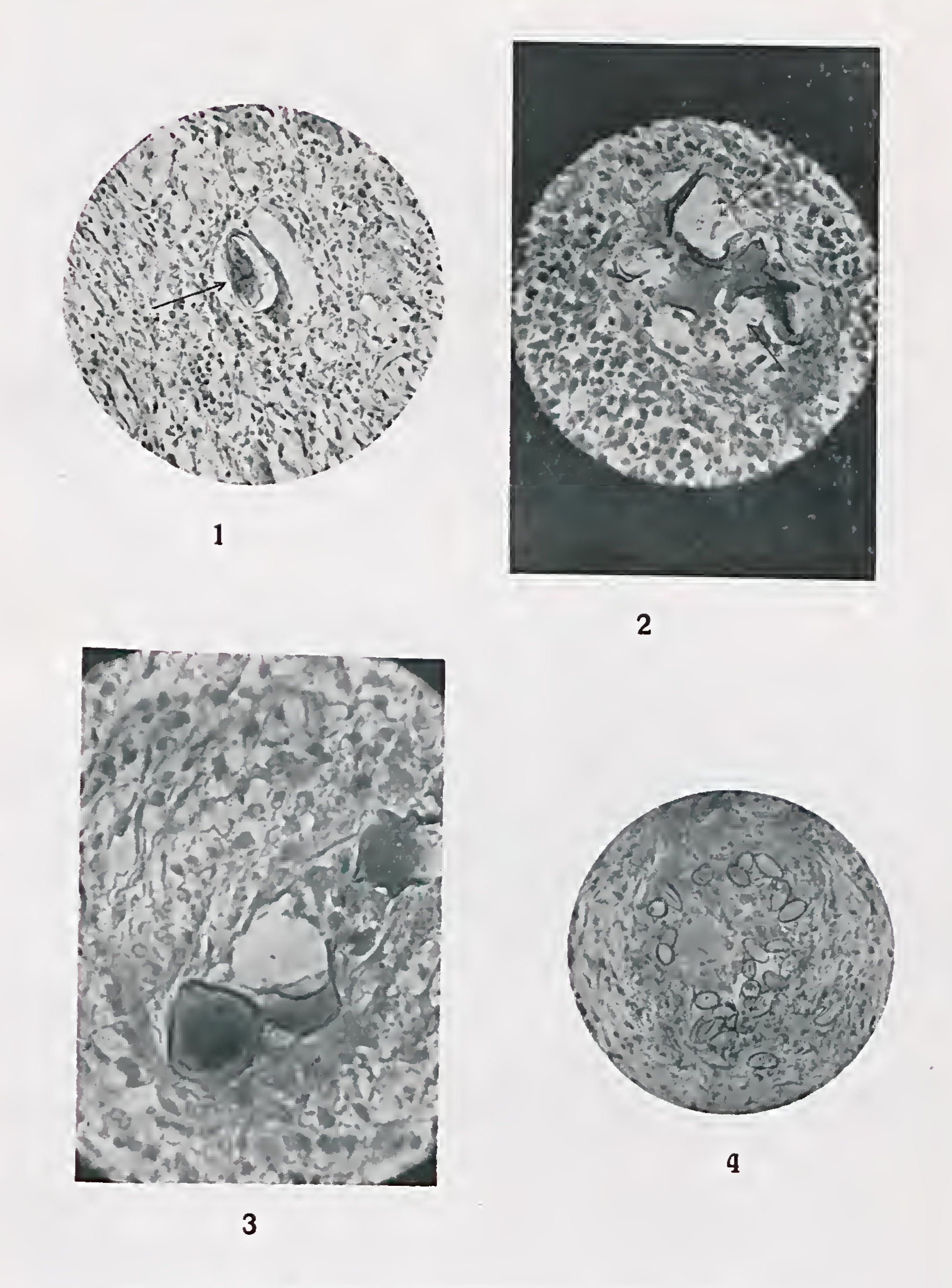
Plate 5

Fig. 1 — A giant-cell that has made an opening on the shell of a *Schistosoma* egg and is raiding the miracidial content. Note the more compact cytoplasm of the phagocyte and the hardly distinguishable nuclei. (High power; natural human infestation of myocardium).

Fig. 2 — A very highly magnified photomicrograph of a section of a lymph node (human) showing crumpled *Schistosoma* eggs whose interiors have been raided by giant-cells of their miracidial content.

Fig. 3 — Three eggs of *Schistosoma* seen within the cytoplasm of a huge giant-cell or giant-cells that have fused together. (Highly magnified).

Fig. 4 — Photomicrograph (high power) of the interior of an experimentally produced nodule showing a large number of *Monorchotrema taihokui* eggs. Note the complete absence of giant-cells.



Africa & Leon: Mechanism of phagocytosis of various helminth ova.

The Life History of the Gizzard-Worm (Cheilospirura hamulosa) and its Mode of Transmission to Chickens, with Special Reference to Hawaiian Conditions.

Joseph E. Alicata, Ph. D.
Parasitologist, University of Hawaii, Honolulu, T. H.

[With 5 plates and 1 text-figure].

A. Introduction

On account of the recognized importance and prevalence of gizzard-worm infestations in chickens in the Territory of Hawaii, an investigation was carried out during 1936 for the study and further elucidation of some problems which were still partially or completely unsolved, especially in regard to modes of transmission of this parasite (Fig. 1 .



Fig. 1 — Gizzard-worms, *Cheilospirura hamulosa.* Natural size.

Previous to this investigation. important facts regarding the life cycle of this parasite were known. Cram, in 1931, gave an account of its development, and for the first time pointed out that grasshoppers, *Melanoplus femur-rubrum* and *M. differentialis* could serve as intermediate hosts. Later, Cuvillier, in 1933, reported that another grasshopper, *Paroxya clavuliger.* also could serve as an intermediate host. Although these reports indicated some possible ways of transmission of gizzard-worms, especially to birds allowed to run free on the ground, they could not account, in Hawaii, for heavy infestations in birds raised under confinement in houses set above the ground where the birds had little or no access to grasshoppers.

This paper reports data obtained on the development of the parasite in the intermediate and final hosts, and observations on various arthropods which have been found to be carriers both under experimental and natural conditions.

B. General Information Regarding Gizzard-Worms

HOSTS. — *Primary* or *final hosts*: Chickens *(Gallas gallus)*, turkeys *(Meleagris gallopavo)*; *secondary* or *intermediate hosts*: Grasshoppers (the only intermediate hosts formerly known) and beetles, weevils, and sandhoppers (reported in this paper).

LOCATION. — The parasites are usually found in the gizzard, coiled under the corneous lining or in the muscular walls (Pl. 1 - D).

GEOGRAPHICAL DISTRIBUTION. — Cosmopolitan: Hawaii and, according to Cram (1927), North America (United States), South America (Brazil and Argentina), Europe (Italy, France, and Russia), and Australia.

MORPHOLOGY. — *Male* about 10 to 14 mm. long. Two unequal and dissimilar spicules (Pl. 3 - D); right spicule flattened, about 230 to 250 microns long, left spicule filiform, about 1.63 to 1.80 mm. long. Posterior extremity of male, according to Cram (1931), with 4 pairs precloacal and 6 pairs postcloacal papillae (Pl. 3 - E). *Female* about 11 to 29 mm. long; vulva slightly posterior to equator of body. Tail digitiform (Pl. 3-C), about 590 to 768 microns long. Eggs 41 to 45 microns long by 27 microns wide, embryonated (Pl. 4 - A) when oviposited.

PATHOLOGY and SYMPTOMS. — Depending on the degree of infestation, the lining of the gizzard may show from small to large ulcerations which may involve also the muscular tissue (Pl. 1-B, C). Soft nodules enclosing parasites are frequently found in the muscular portion, especially in the thinner portions of the gizzard. In heavy parasitic infestation the gizzard becomes enlarged and frequently loses its natural shape (Pl. 1 - A).

The symptoms caused by the presence of the parasite vary largely with the degree of infestation. Mild infestations are hardly noticeable, whereas severe infestations produce anemia and emaciation.

C. Life History Investigations

1. — *Material and Methods.*

This investigation involved the experimental feeding of eggs of *Cheilospirura hamulosa* to various arthropods, including grasshoppers, beetles, weevils, sandhoppers, flies, sowbugs, and earwigs, which were found to be commonly present on poultry farms, and which might serve as intermediate hosts of gizzard worms. On account of the variety of arthropods involved, it was necessary to use different methods in feeding and keeping them alive. Young grasshoppers were collected in fields by net and were later transferred to cages having a wooden frame-work and with sides lined with cloth. The front of each cage was provided with a cloth sleeve for the purpose of transferring grasshoppers and putting feed into the cage. A small receptacle containing water and fresh alfalfa for the grasshoppers to feed on was placed in each cage. Worm eggs secured by chopping gravid female worms into two or three pieces were

fed to the grasshoppers directly with the aid of forceps. The feeding of house flies was best carried out by thoroughly chopping up gravid female worms, and mixing this material in a drop of diluted sugar solution which was readily accepted by the flies. These insects also were kept in cages of the same sort used for grasshoppers. Beetles, weevils, sandhoppers, roaches, sowbugs, and earwigs were fed by allowing them to feed on tiny pieces of bread soaked with water containing chopped-up gravid female worms; they were kept in Erlenmeyer flasks of various suitable sizes.

2. — *New Intermediate Hosts for Gizzard-Worms Discovered in the Present Investigation.*

As a result of experimental feeding of eggs of *Cheilospirura hamulosa* to the various arthropods mentioned above, infective third-stage larvae were developed in the following intermediate hosts:

a) — Grasshoppers [*Conocephalus saltator, Atractomorpha ambigua* and *Oxya chinensis* (Pl. 2-A, B, C)];

b) — Sandhopper [*Orchestia platensis* (Pl. 2-G)];

c) — Beetles [*Tribolium castaneum, Tenebroides nana, Carpophilus dimidiatus* (Pl. 2-D, E, F)], *Dactylosternum abdominale, Typhaea stercorea, Palorus ratzeburgi, Euxestus* sp., and *Litargus balteatus*;

d) — Grain and rice weevils (*Oxydema fusiforme* and *Sitophilus oryzae*).

The above intermediate hosts were reported by the writer in preliminary notes in 1936 and 1937; since that time an additional beetle, *Epitragus diremptus*, has been found to serve as an intermediate host.

No experimental infestation with gizzard-worm larvae was obtained in the following arthropods: Flies (*Musca domestica*), roaches (*Pycnoscelus surinamensis*), sowbugs (*Porcellio laevis*), and earwigs (*Euborellia annulipes*).

Of the above mentioned arthropods, *Tenebroides nana, Epitragus diremptus, Orchestia platensis*, and certain species of grasshoppers discussed later, have been found also naturally infested with third-stage gizzard-worm larvae.

3. — *Development of Gizzard-Worm Larvae in the Intermediate Host.*

The development of the larvae in the intermediate host was advantageously carried out in young grasshoppers, experimental animals which could easily be fed a large number of eggs at one feeding, and as a result made possible the recovery of a large number of developing larvae for study.

Grasshoppers dissected 5 hours after they had been fed gizzard-worm eggs, already had empty egg-shells and newly hatched first-stage larvae (Pl. 4-B, C) in their crops. Grasshoppers dissected 24 hours after experimental feeding showed larvae in the body cavity. (For measurements of these larvae, see Table I). At the end of 11 days, the wandering larvae had about doubled their size, appeared somewhat plump, and were beginning to undergo the first molt (Pl. 4-D). This molt was not completed, however, until about the 14th day after infection, when some larvae were noted in the second stage.

The second-stage larvae (Pl. 1-E) also wandered in the body cavity of the grasshopper, where they increased in length and width. On the 17th day after experimental infection, the larvae were noted undergoing the second molt, (Pl. 1-F) and third stage larvae were found in grasshoppers dissected 2 days later.

Table 1. *First-stage larvae.*

Period of development	*(days)*	*1*	*1*	*3*	*9*	*11*[1]	*11*[1]
Length of body	(microns	258	267	274	377	422	455
Maximum width of body	,,	9	9	9	23	26	30
Length of esophagus	,,	110	114	114	125	175	189
Distance of nerve ring from anterior end	,,	—	—	—	68	72	76
Distance of excretory pore from anterior end	,,	80	87	87	91	95	95
Length of tail	,,	53	53	61	84	84	95

[1] Larva undergoing first molt.

Table 2. *Second-stage larvae.*

Period of development	*(days)*	*14*	*14*	*14*	*15*	*17*[1]
Length of body	(microns)	613	613	649	690	706
Maximum width of body	,,	42	40	40	40	40
Length of proesophagus	,,	—	80	—	95	87
Length of postesophagus	,,	—	152	—	170	171
Distance of nerve ring from anterior end	,,	80	76	80	—	74
Distance of excretory pore from anterior end	,,	95	95	—	95	99
Length of tail	,,	114	114	114	114	114

[1] Larva undergoing second molt.

Table 3. *Third-stage larvae.*

Period of development	*(days)*	*19*	*19*	*19*	*19*	*19*
Length of body	(Microns)	690	690	700	700	705
Maximum width of body	,,	47	49	49	49	49
Length of buccal cavity	,,	72	74	72	68	72
Length of proesophagus (including buccal cavity	,,	138	136	136	133	133
Length of postesophagus	,,	228	226	269	240	257
Distance of nerve ring from anterior end	,,	72	74	72	72	74
Distance of excretory pore from anterior end	,,	95	95	87	84	87
Length of tail	,,	105	99	99	96	99

After reaching the third stage, each larva began to encyst in the musculature and became tightly coiled upon itself (Pl. 2-H and Pl. 5-E). A striking characteristic of the third-stage larva as pointed out by Cram (1931), is its dorsal curvature of the posterior portion (Pl. 5-A). At the anterior end, the larva possesses 2 prominent lips, and the tail-end bears 4 digitiform processes, 1 dorsal, 2 lateral, and 1 ventral, the dorsal process being usually the largest (Pl. 4-G).

The following table gives the principal measurements of the first-, second-, and third-stage larvae of *Cheilospirura hamulosa* at various periods of development in the grasshopper *Oxya chinensis.*

4. — *Development of Gizzard-Worm in the Final Host.*

Experiments on the development of the larvae in the final host were carried out by feeding 3-day old chicks with experimentally infected grasshoppers, and examining the gizzard of these chicks at various intervals. The results of these experiments are indicated below.

Chick 1, killed 24 hours after infection. The gizzard showed no lesions. Third-stage larvae were recovered from the corneous lining of the gizzard.

Chick 2, killed 12 days after infection. The gizzard showed no lesions. Third- and fourth-stage larvae were found in the lining of the gizzard, and also partially embedded in the muscular wall underneath the lining. Some of the larvae were undergoing their third molt. Size of fourth-stage larvae: *Males*, 2.06 mm. long, 0.09 mm. wide; *females*, 2.6 mm. long, 0.12 mm. wide. A female third-stage larva undergoing the third molt measured 1.2 mm. in length and 0.05 mm. in width.

Chick 3, killed 16 days after infection. The lining of the gizzard was somewhat rough on its surface and difficult to detach from the muscle tissue. Fourth-stage larvae (Pl. 5-B, C, D, F) undergoing the fourth molt were found partially embedded in the musculature of the gizzard as in chick 2. Size of larvae: *Males* 3.1 to 3.4 mm. long, 0.13 mm. wide; *females* 3.7 to 4 mm. long, 0.12 mm. wide.

Chick 4, killed 21 days after infection. The lining of the gizzard was somewhat rough on its surface and difficult to detach. Small openings were visible on the surface of the muscle underneath the lining. Fourth-stage larvae undergoing the fourth molt were found in the gizzard lining and partially embedded in the musculature. Size of larvae: *Males* 3.2 to 3.5 mm. long, 0.12 mm. wide; *females* 3.8 to 4 mm. long, 0.12 mm. wide.

Chick 5, killed 42 days after infection. Several small ulcerated areas were noted in various portions of the gizzard, but especially on the areas where the tissues were the softest. Young adult (fifth-stage) worms were found scattered in the muscular wall of the gizzard. Size of worms: *Males* 5.3 mm. long, 0.20 mm. wide; *females* 7 to 8 mm. long, 0.23 to 0.25 mm. wide.

Chick 6, killed 63 days after infection. Several ulcerated areas were found on the softest portion of the gizzard close to the openings of the proventriculus and intestine. Young adult worms were found to be more concentrated in the muscle tissue near to the location of the lesions. Size of worms: *Males* 6.5 mm. long, 0.23 mm. wide; *females* 8.0 mm. long, 0.29 mm. wide. No developed eggs were noted in the uteri of these females.

Chick 7, killed 77 days after infection. The lesions and location of the parasites were as in chick 6. Size of worms: *Males* 6.5 mm. long, 0.23 mm. wide; *females* 9.0 mm. long, 0.29 mm. wide. Females without developed eggs in the uteri.

Chick 8, killed 90 days after infection. Several large ulcerated areas were noted on the lining on the softest portion of the gizzard near the opening of the intestine. Adult worms were found under the lining below the ulcerated areas. Size of worms: *Males* 9.0 mm. long, 0.3 mm. wide; *females* 14 mm long, 0.38 mm. wide. Embryonated eggs were noted in the uteri of these females.

In summarizing the results of the above findings, one may derive the following conclusions: Infective gizzard-worm larvae, after being ingested by a chick, penetrate the lining of the gizzard within 24 hours. They molt to fourth-stage larvae about the twelfth day after infection. At this time they are in the process of entering deeper into the muscle tissue of the gizzard. From about the sixteenth to the twenty-first day, or possibly later, the larvae which are still in the act of penetrating the muscle tissue undergo the fourth molt and transform into fifth-stage or adult worms which are as yet sexually immature. The young adult worms penetrate then in the deeper portion of the muscles, eventually concentrating in the softest portions of the gizzard, and reach sexual maturity.

In regard to the time required for the female gizzard worms to reach the egg-laying period, Cram (1931) reported finding female worms 15 to 17 mm. long, with embryonated eggs in the uteri, in birds 76 days after experimental infection. In the present investigation, the writer found female worms with embryonated eggs in the uteri 90 days after experimental infection. These reports indicate that there is some variation in the rapidity of development of these parasites in the final host.

D. **Field Surveys**

In order to determine the prevalence of gizzard worm infestation in chickens in the Territory of Hawaii, field trips were made to some of the larger poultry farms on the islands of Kauai, Oahu, Maui, and Hawaii. The number of poultry farms visited on each island and the number reporting presence of gizzard worm were as follows: Kauai, 12 visited, 8 with gizzard worms; Oahu, 6 visited, 6 with gizzard worms; Maui, 10 visited, 5 with gizzard worms; Hawaii, 8 visited, 6 with gizzard worms, making a total of 23 out of 36 or about two-thirds of poultry farms visited reporting the presence of this parasite. The extent of gizzard-worm infestation in birds in various poultry farms was reported to the writer to vary from occasional to somewhat frequent; in one poultry farm on Maui, 18 out of 32 chickens necropsied, or 56 percent were found to be infested with gizzard worms.

The infestation of chickens with gizzard worms in Hawaii was found both in birds that were raised on the ground and those kept in confinement in various types of screened poultry houses. This information in the beginning of this investigation led us to believe that there were possibly other intermediate hosts besides grasshoppers responsible for the transmission of the parasite. In order to find naturally infested intermediate hosts, various arthropods

were collected from areas where gizzard-worm infestation was prevalent, and were examined for infective larvae of the parasite. In a poultry farm on Oahu, 5 out of 100 sandhoppers *(Orchestia platensis)* examined were found infested with gizzard-worm larvae. In another farm on Oahu, the larvae were found in 1 out of 5 beetles *(Epitragus diremptus)* examined. In a farm on the island of Maui, 6 out of 100 beetles *(Tenebroides nana)* harbored infective gizzard worm larvae. The larvae recovered from each of these naturally infested arthropods produced an infection when fed to laboratory-raised chicks.

In order to determine whether or not grasshoppers under natural conditions may be carriers of gizzard worms, about 2.300 grasshoppers, collected in an infested area, were fed to 8 laboratory-raised chickens. At the end of 30 days, the chickens were killed, and 2 of them were found infested with gizzard worms. Three control chickens, also laboratory-raised, remained free of gizzard worms. These experiments indicate that at least some of the grasshoppers fed to the birds harbored infective larvae of the parasite.

E. Discussion and Suggested Control Measures

The present laboratory and field investigations have shown that a variety of arthropods, including grasshoppers, sandhoppers, beetles, and weevils may serve as carriers of gizzard worms to chickens. This indicates, undoubtedly, that there are possibly others in the same or other groups of arthropods which may serve as additional vectors. As a control measure, therefore, it is advisable to keep birds from eating arthropods of various sorts, and to remove poultry droppings from poultry farms as often and as far as possible so that arthropods may not feed on them.

The grasshopper population in a poultry farm may be reduced by keeping down weeds and other vegetation that may attract them. Beetles may be controlled to some extent by general cleaning or disinfecting beetle-infested feed-store-rooms, poultry houses, feeding throughs, nest boxes and other places in which beetles are commonly found; the removal of poultry droppings or other breeding places and sources of food for beetles is also essential. Sandhoppers which live mainly on wet or damp areas may be controlled by filling in low areas in which water accumulates and preventing water from water-fountains or other sources to continually overflow on the ground. The writer has found that small amounts of fine granulated copper sulphate, broadcasted over a wet area, will kill most of the sandhoppers present.

As regards medicinal treatment of infested birds, no drugs are thus far known which will affect these parasites in their usual location under the lining of the gizzard or in the muscular tissue. Carbon tetrachloride, in a dose of 1 cc. for each adult bird, was found by the writer to be ineffective in killing gizzard worms in 6 infested chickens on which it was tried.

SUMMARY

1. Experimentally, 15 species of arthropods were shown to be capable of serving as intermediate hosts of gizzard worms, namely, 3 species of grasshoppers, 1 species of sandhopper, 9 species of beetles, and 2 species of weevils.

2. In gizzard-worm endemic areas the following arthropods have been found naturally infested with infective gizzard-worm larvae, namely the flour beetle, *Tenebroides nana*, a manure-feeding beetle, *Epitragus diremptus*, and the sandhopper, *Orchestia platensis*.

3. When fed to grasshoppers, eggs of gizzard-worms hatched within 5 hours, and the larvae developed to the third or infective stage in about 19 days.

4. When fed to chicks, third-stage larvae penetrated the gizzard, and the females reached the egg-laying stage in about 76 to 90 days.

5. The third-stage larvae penetrated the lining of the gizzard within 24 hours after infection. In 12 days they have been found penetrating deeper into the musculature, and in 42 days they were entirely in the musculature, concentrated mainly in the softest portion of the gizzard near the intestinal opening.

6. Lesions, consisting at first of general roughness of the lining of the gizzard, were noted 16 days after infection. Ulceration of the lining was seen 42 days after infection and later. The lesions were mostly concentrated on the lining in the softest portion of the gizzard near the intestinal opening.

7. Control measures suggested involve frequent removal of poultry droppings from poultry yards, prevention of fowls from eating beetles, grasshoppers, and sandhoppers, and general control measures for arthropods on poultry farms.

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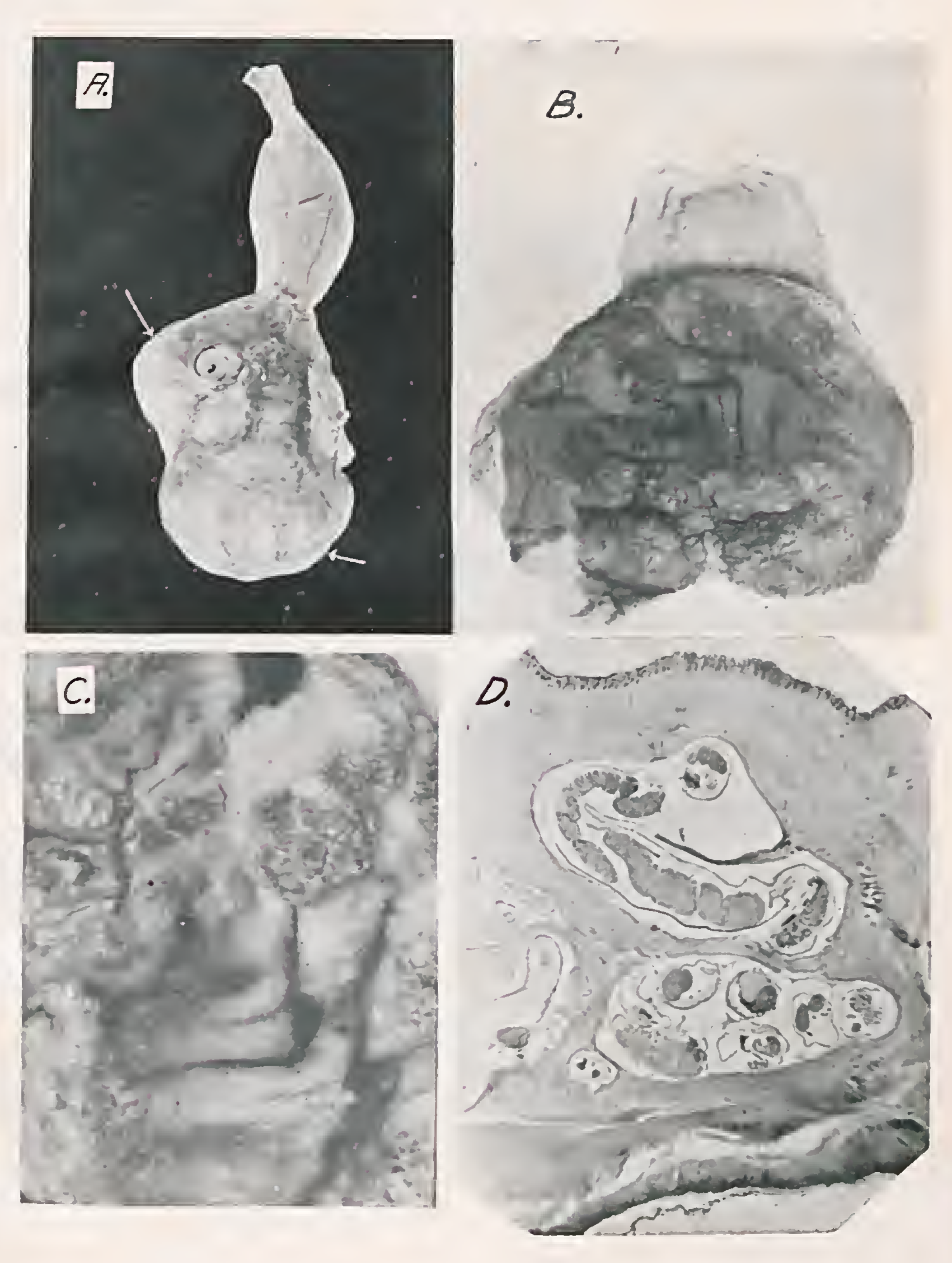
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Plate 1

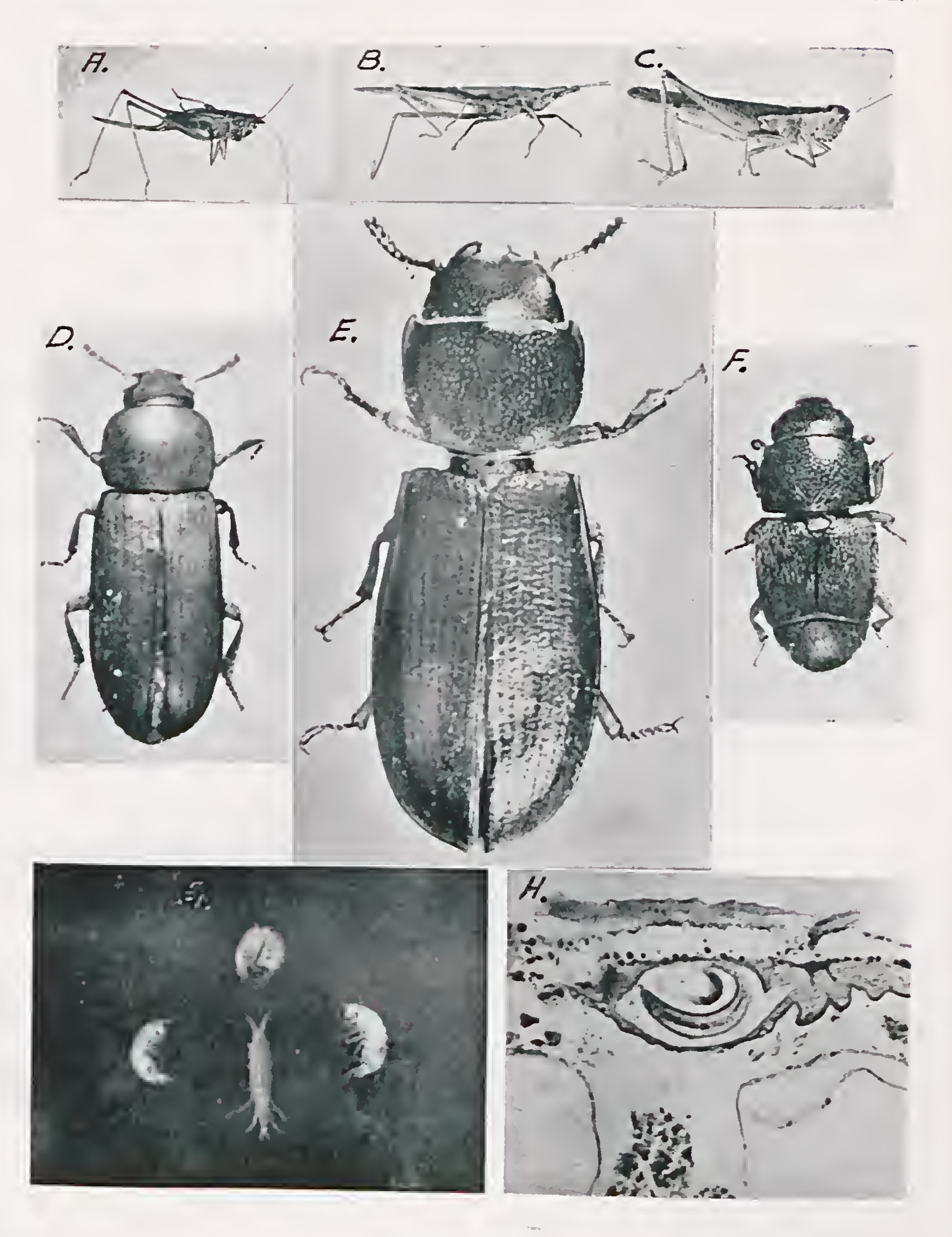
(A) Gizzard of chicken heavily infested with gizzard-worms. Note the enlargement of the thinner portions *(muscularis intermedii)* on the anterior and posterior parts of the gizzard indicated by arrows; (B, C) Gizzard of chicken opened to show gizzard-worm lesions on the inner lining; (D) Cross section of gizzard showing gizzard-worms in the wall of the gizzard.



Alicata: The life-history of the gizzard-worm.

Plate 2

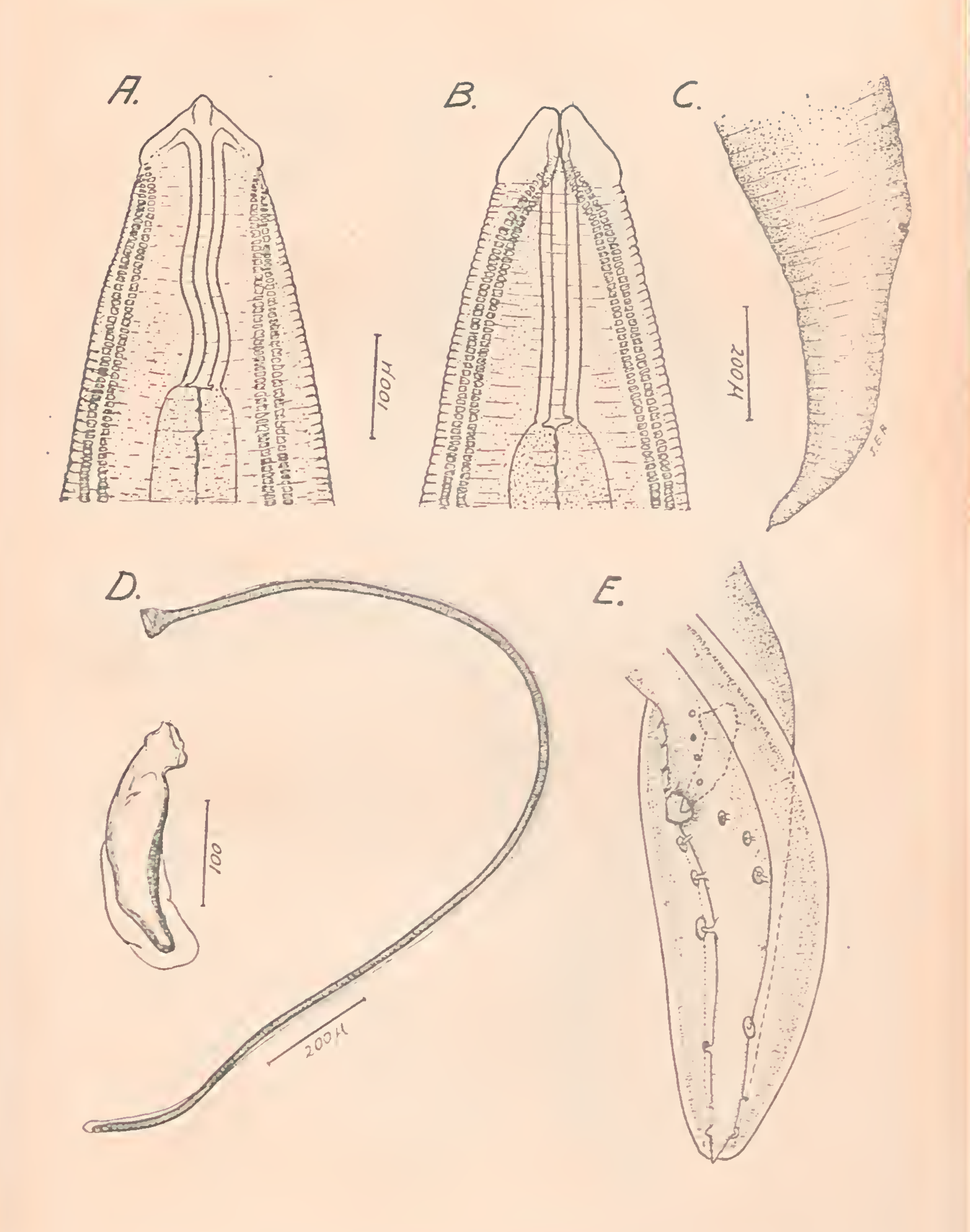
Some intermediate hosts for gizzard-worms. (A) *Conocephalus saltator*; (B) *Atractomorpha ambigua*; (C) *Oxya chinensis*; (D) *Tribolium castaneum*; (E) *Tenebroides nana*; (F) *Carpophilus dimidiatus*; (G) *Orchestia platensis*; (H) Cross section of a grasshopper (*Oxya chinensis*) showing gizzard-worm larva encysted in the body wall. Experimental infection.



Alicata: The life-history of the gizzard-worm.

Plate 3

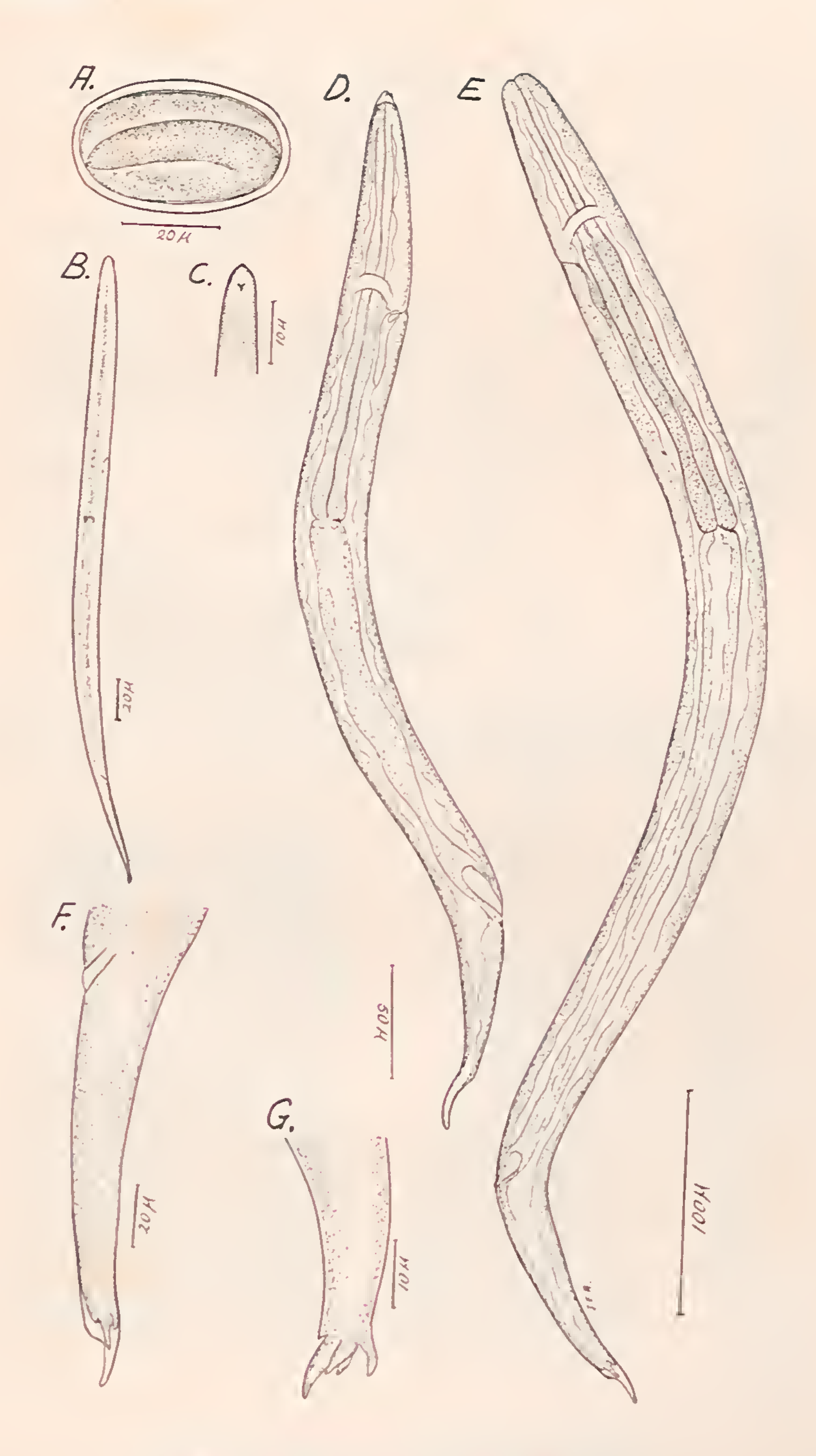
Portions of adult gizzard-worms. (A. B) Anterior portion; (C) Posterior portion of female; (D) Right and left spicules, Orig. (E) Posterior portion of male (after Cram, 1931).



Alicata: The life-history of the gizzard-worm.

Plate 4

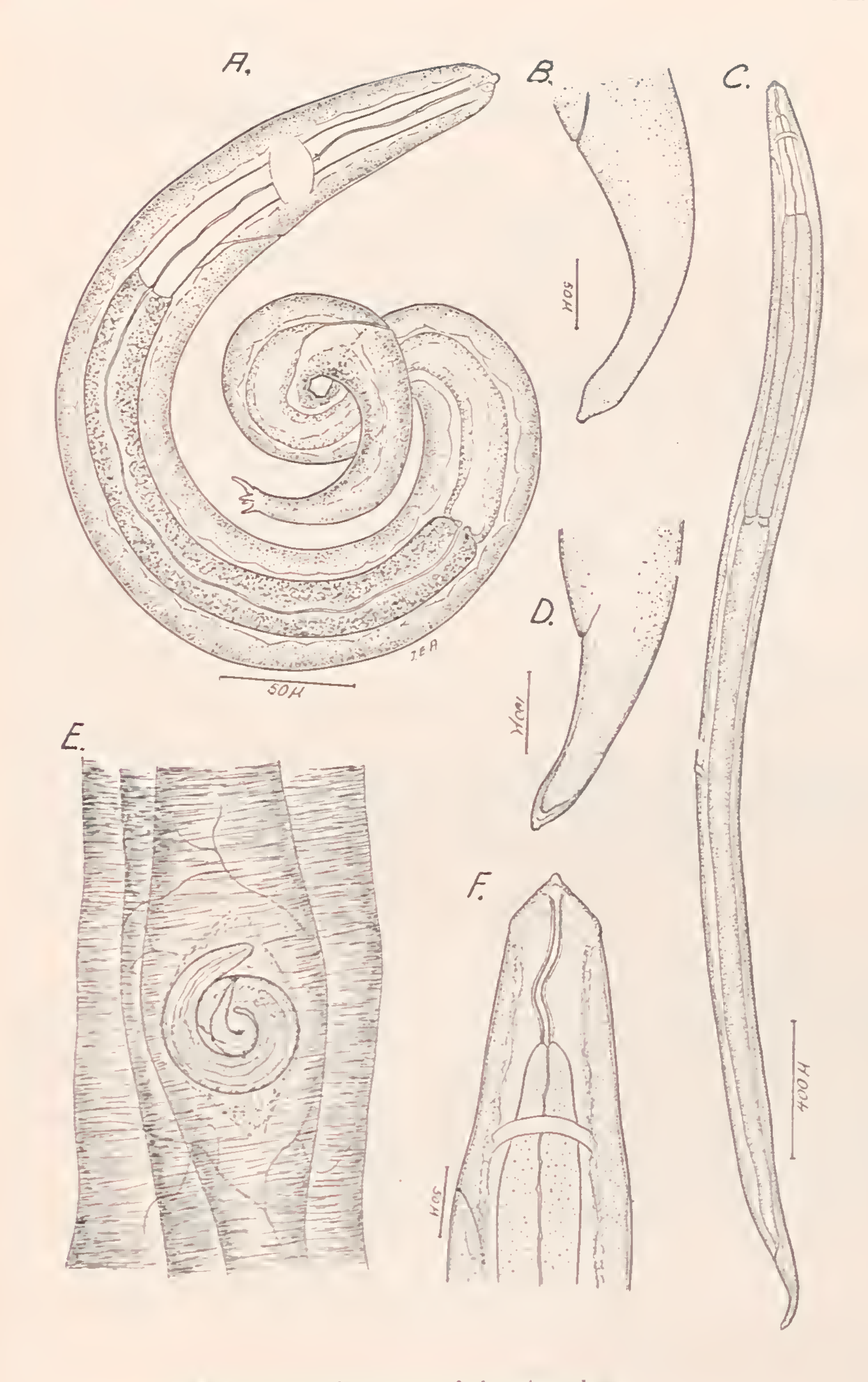
Egg and larvae of gizzard-worms. (A) Embryonated egg; (B) Newly hatched first-stage larva; (C) Anterior end of first-stage larva; (D) First-stage larva undergoing first molt; (E) Second-stage larva; (F) Posterior portion of second-stage larva in second molt; (G) Tail of third-stage larva, showing digitiform processes.



Alicata: The life-history of the gizzard-worm.

Plate 5

Gizzard-worm larvae. (A) Third-stage larva; (B) Tail of fourth-stage larva; (C) Fourth-stage larva; (D) Tail of fourth-stage larva in fourth molt; (E) Third-stage larva encysted in the musculature of a grasshopper; (F) Anterior end of fourth-stage larva.



Alicata: The life-history of the gizzard-worm.

Sobre um interessante parasito de insecto: Lauronema travassosi n. gen., n. sp.

(Nematoda)

Jayme Lins de Almeida
Instituto de Biologia Animal, Rio de Janeiro — Brasil.

[Com 1 estampa]

O estudo que paulatinamente estamos executando sobre os nematoides parasitos de arthropodos nos deu ensejo de encontrar uma especie bastante curiosa que julgamos representar um novo genero.

O material helminthologico foi collectado do intestino de um insecto coleoptero capturado em Jacarépaguá (Districto Federal). Infelizmente o material é escasso e parece não ser de um parasito muito frequente, porquanto o exame de cerca de trinta exemplares de coleopteros da mesma especie e de igual procedencia, apenas, revelou parasitismo em um delles. Os nematoides estudados foram cinco machos e duas femeas, algo deformadas, depois de fixados pelo formol a 10 %.

Para esses nematoides propomos a denominação de *Lauronema travassosi* n. gen., n. sp., em homenagem ao Prof. Lauro Travassos, eminente scientista brasileiro, orientador da escola brasileira de helminthologia e cujo jubileu ora se commemora.

Lauronema representa um novo genero distincto dos outros nematoides que parasitam os arthropodos, possuindo longiquas affinidades, apenas, com o genero *Probstmayria* Ransom, 1907, parasito de equideos, segundo acreditamos.

Achamos que deve ser incluido entre os representantes da familia *Cosmocercidae* Travassos, 1925.

Lauronema n. gen.

Nematoides pequenos, fusiformes, ligeiramente truncados anteriormente e subulados na parte posterior, sem dimorphismo sexual. Bocca trilabiada, de labios delicados e salientes; papillas peribuccaes presentes. Vestibulo allongado, cylindrico e de paredes chitinosas; pharynge ausente; esophago longo, cylindrico e provido posteriormente de bulbo pyriforme. Annel nervoso no terço posterior do esophago.

Macho de cauda longa, subulada, apparentemente desprovida de papillas. Apparelho genital simples. Dois espiculos sub-iguaes; gubernaculo presente.

Femeas amphidelphas; vulva mediana; viviparas, com larvas desenvolvidas no corpo materno. Cauda muito longa e subulada.

HABITAT: — Intestino de *Coleoptera-Scarabaeidae*.
ESPECIE TYPO: — *Lauronema travassosi* n. sp.

Lauronema travassosi n. sp.

Comprimento: — Macho 1,2 a 1,35 mm.; femea 1,55 a 1,72 mm.
Largura maxima: — Macho 0,006 a 0,007 mm.; femea 0,006 a 0,008 mm.

Nematoides sem dimorphismo sexual accentuado, fusiformes, ligeiramente truncados na parte anterior do corpo e subulados posteriormente. Cuticula branca, delgada, estriada finamente no sentido longitudinal e transversal. Bocca trilabiada, de labios delicados, salientes, de cuticula entumescida; a bocca é de abertura circular e revestida interiormente de chitina. Em continuação á bocca ha vestibulo de paredes fortemente chitinisadas, cylindrico e medindo de comprimento, nos dois sexos, 0,017 a 0,020 mm. Pharynge ausente. Esophago propriamente dito cylindrico, medindo nos machos 0,115 a 0,123 mm. e nas femeas 0,120 a 0,130 mm. de comprimento. Na base do esophago ha o bulbo pyriforme provido de valvas chitinosas, medindo, nos machos, cerca de 0,020 mm. de comprimento e nas femeas 0,024 a 0,025 mm. Intestino rectilineo, extendendo-se ao longo do corpo. Annel nervoso localisado a cerca de 0,1 mm. da extremidade anterior. Póro excretor ao nivel do bulbo?

Macho com apparelho genital simples, mais ou menos tubuloso, acompanhando o intestino, sendo que anteriormente existe uma alça testicular a cerca de 0,25 a 0,30 mm. da base do esophago. A abertura cloacal dista 0,40 a 0,53 mm. do apice caudal. Dois espiculos curtos, sub-iguaes, de base espatulada e arredondada, de morphologia caracteristica (Fig. 1), medindo 0,045 a 0,050 mm. de comprimento. Gubernaculo pequeno, simples, em forma de haste com apice afilado, tendo 0,020 a 0,025 mm. de comprimento. Cauda muito longa e apparentemente desprovida de papillas.

Femea amphidelpha, de ramos uterinos divergentes, ovejector curto, vulva transversal distante 0,62 a 0,75 mm. da extremidade anterior e 0,51 a 0,60 mm. do anus. A femea deve ser vivipara, parecendo que as larvas evolvem no corpo materno; essas larvas são, nos exemplares examinados, em numero de tres ou quatro e medem 0,161 a 0,250 mm. de comprimento. Anus distante 0,45 a 0,48 mm. da extremidade posterior.

HABITAT: — Intestino de *Ligyrus ebenus* (De Geer, 1771) (Syn.: *Cyclocephala scarabaeina* Perty, 1830) *Coleoptera-Scarabaeidae*.
DISTRIBUIÇÃO GEOGRAPHICA: — Jacarépaguá, Districto Federal, Brasil.

Ao Dr. A. M. da Costa Lima, do Instituto Oswaldo Cruz, os nossos agradecimentos pela determinação dos coleopteros. Ao Snr. Mauricio Cabral agradecemos o abundante material de insectos que nos proporcionou a exame.

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1934. *Daubaylia potomaca* n. sp., a nematode parasite of snails, with a note on other nemas associated with molluscs. Proc. Helminth. Soc., Washington, **1** : 8-9, fig. 4.

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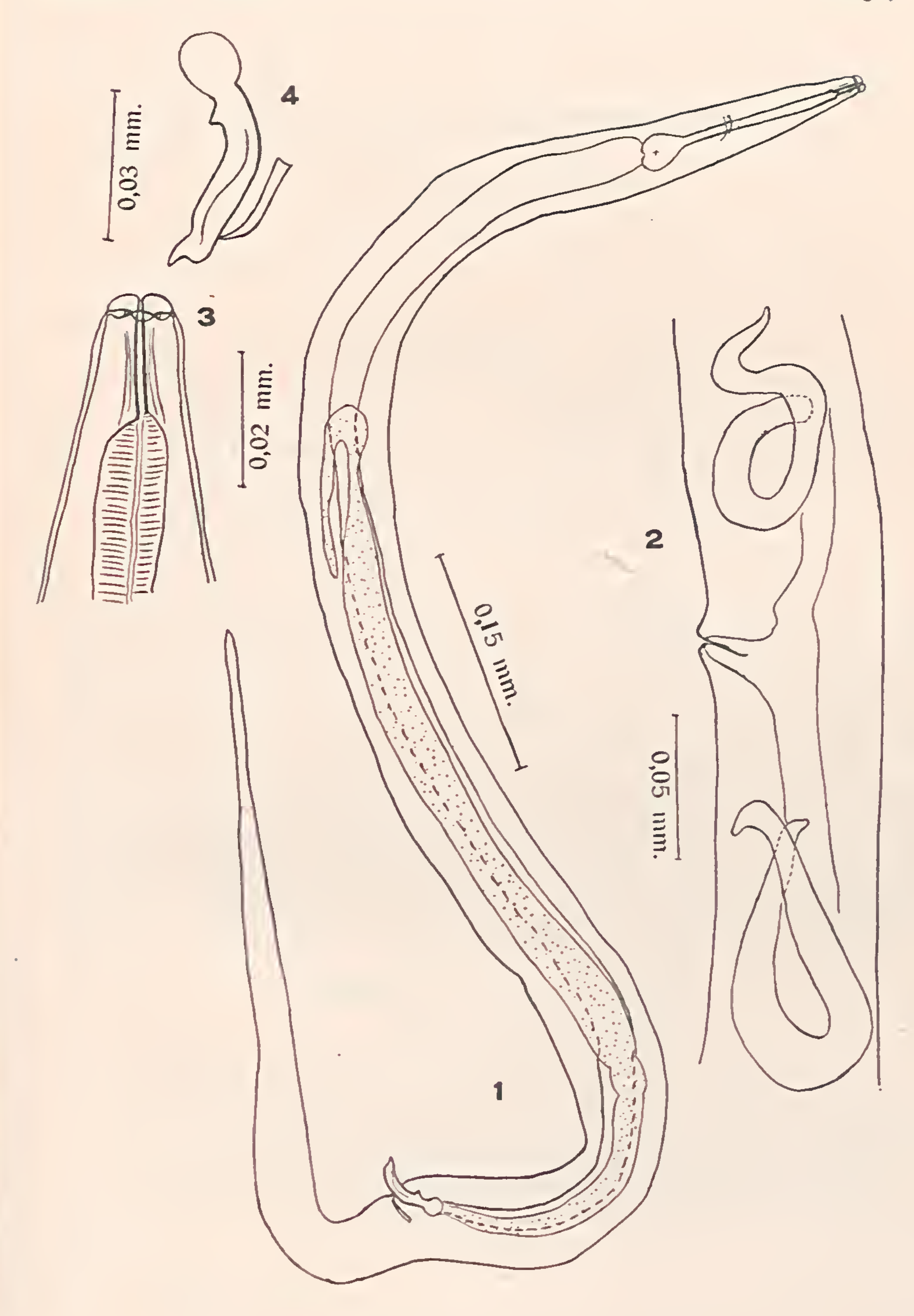
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Estampa 1

Lauronema travassosi n. gen., n. sp.

Fig. 1 — Macho total.
Fig. 2 — Região vulvar.
Fig. 3 — Extremidade anterior do corpo.
Fig. 4 — Espiculos (superpostos) e gubernaculo.



Almeida : *Lauronema travassosi* n. gen., n. sp.

Revisão do genero Pseudopieris G. & S.

R. Ferreira d'Almeida
Instituto Oswaldo Cruz, Rio de Janeiro — Brasil

[Com 2 estampas e 2 figs. texto]

PSEUDOPIERIS G. & S.

Pseudopieris 1889 Godman & Salvin, Biol. C. Amer., Lep. Rhop., 2, p. 187 (typo: *nehemia* Bdv.).
Pseudopieris 1900 Grote, Proc. Amer. Phil. Soc., 39, p. 16.
Pseudopieris 1909 Röber *in* Seitz, Macrol. 5, p. 98.
Pseudopieris 1931 Klots, Ent. Amer., 12 : 3, p. 163, 164.
Pseudopieris 1932 Talbot *in* Strand, Lep. Cat., 53, p. 25.

Azas brancas, as anteriores com M 1 [1] anastomosada na base com R, a segunda mediana ausente, R 1 não se unindo na extremidade com SC. Nas azas posteriores a cellula discoidal é bem mais curta anteriormente do que nas especies do genero *Dismorphia*. Antennas curtas. Macho sem macula sexual distincta. Ultimo segmento abdominal prolongando-se dorsalmente em dois grandes lobulos arredondados que occultam quasi totalmente o apparelho genital que é do mesmo typo dos do genero *Dismorphia*, isto é, tem as valvas muito reduzidas e soldadas ventralmente, apresentando cada uma dellas um lobulo apical bem desenvolvido e chitinisado; a transtilla, o estojo do penis, bem assim a parte interna das valvas teem egualmente a mesma estructura da das especies deste ultimo genero. Penis muito longo, um pouco mais do triplo do comprimento do saccus, um tanto curvado, funccionando dentro de um estojo bem desenvolvido e que se acha seguro no interior das valvas. Uncus com dois grandes lobulos cujas extremidades são bem chitinisadas. Não ha dimorphismo sexual.

Pseudopieris nehemia (Boisd., 1836)

a) *nehemia nehemia* Boisd.

(Texto: figs. 1 e 2; est. 1, figs. 1, 3 a 8; est. 2, figs. 5 e 7).

Pieris nehemia 1836 Boisduval, Spec. Gén. Lép., 1, p. 528, n. 132. Brasil.
Leptalis cydno 1842 Doubleday, Gray's Zool. Misc., p. 75. (Mexico).
Leptalis nehemia 1846 Doubleday, Westwood & Hewitson, Gen. D. Lep., p. 37, n. 27 (=*cydno*). Brasil, Mexico.

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[1] Notação de Comstock.

Leptalis nehemia 1863. Weidemeyer, Proc. Ent. Soc. Phil., 2 p. 150. Mexico.
Leptalis nehemia 1867 Herrich-Schäffer, Corr.-Blatt. zool.-min. Ver. Regensb. 21, p. 125.
Leptalis nehemia 1879 Burmeister. Rep. Arg. Lep., 5, Atlas, p. 11, n. 4. Rio.
Dismorphia nehemia 1884 Staudinger. Exot. Tagf., 1, p. 26, t. 15, macho. (Guatemala, Venezuela, Brasil).
Pseudopieris nehemia 1889 Godman & Salvin. Biol. C. Amer., Lep. Rhop., 2, p. 188, n. 1. Guatemala ao sul do Brasil.
Dismorphia nehemia 1891 Weymer, Stett. Ent. Zg., 55, p. 319, n. 24. Rio Grande do Sul.
Pseudopieris nehemia 1900 Grote, Proc. Amer. Phil. Soc., 39, p. 16, t. 1, f. 3. (nervul.).
Pseudopieris nehemia 1909 Röber *in* Seitz, Macrol. 5, p. 98, t. 28 e.
Pseudopieris nehemia 1916 Jörgensen, An. Mus. N. B.-Aires, 28, p. 518, n. 39. N. Argentina: Misiones, Salta, Jujuy, Tucuman, Catamarca.
Pseudopieris nehemia 1923 Köhler, Zeit. wiss. Ins.-biol. 18 (Sep. p. 19).
Pseudopieris nehemia 1928 Zikan, Ent. Rundsch., 45 : 2, p. 7, n. 48. Itatiaya.
Pseudopieris nehemia 1931 Klots. Ent. Amer.. 12 : 3, p. 164, t. 6, f. 13 (genit.).
Pseudopieris nehemia 1932 Talbot *in* Strand. Lep. Cat., 53, p. 25.
Pseudopieris nehemia 1935 Hoffmann, Ent. Rundsch., 52 : 7, p. 84, n. 32 (S. Catharina).

Comprimento da aza anterior: 22 a 27 mm. Azas de um branco glauco, as vezes com ligeiros tons amarellados, as anteriores tendo estreita bordadura apical e externa bruna em forma de fino traço que não attinge o angulo interno. Azas posteriores sem manchas. Face inferior com a borda costal e toda a região apical das azas anteriores cobertas por uma tinta de um ocraceo pallido um tanto brilhante, sendo desta côr toda a superficie das posteriores, as quaes são marcadas por uma pequena mancha brunacea na extremidade da CD. O disco das azas anteriores é branco. Corpo desta ultima côr, excepto o thorax que é anegrado com pellos acinzentados; as antennas são de um bruno anegrado anneladas de branco cinzento. Femea semelhante ao macho.

Var. *a* — Azas anteriores com a bordadura apical ligeiramente mais larga.
Var. *b* — Face inferior das azas posteriores sem macula bruna na extremidade da CD.

Adeja sobre pequenos arbustos nos logares descobertos, sempre porém proximo das mattas. Pousa com as azas fechadas uma contra a outra. Não é muito commum no Rio. Temos exemplares capturados nos seguintes mezes: Janeiro, Fevereiro, Abril, Junho, Julho, Agosto, Setembro e Dezembro.

Esta especie vôa desde o Mexico até o norte da Argentina. Possuimos exemplares das seguintes localidades: Rio: Corcovado, Tres-Rios em Jacarépaguá; Estado do Rio: Angra dos Reis; S. Paulo: Bananal na serra da Bocaina e Muni-

cipio Wenceslau; Goyaz: Campinas; Republica Argentina: S. Tomé na Prov. Corrientes.

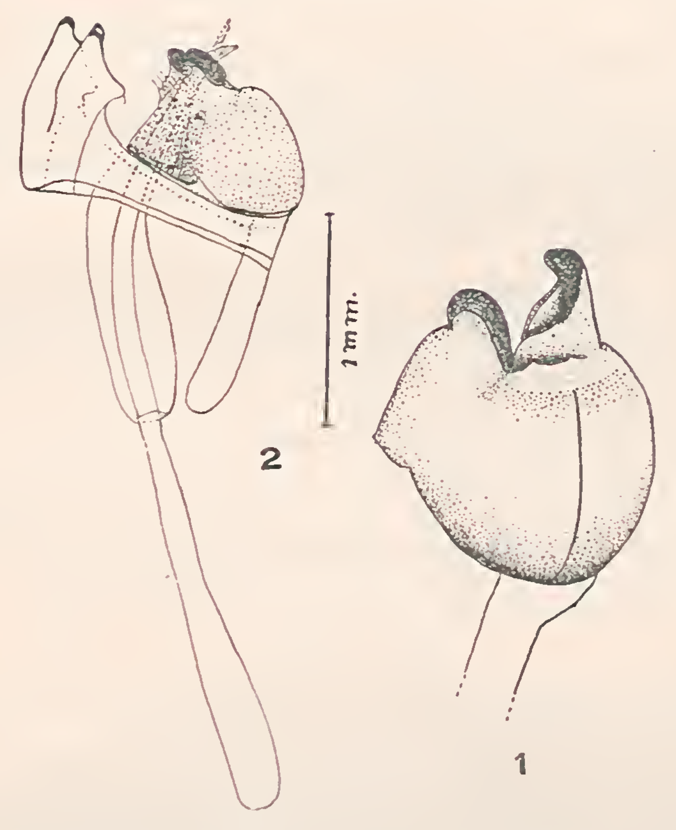


Fig. 1 — *Pseudopieris nehemia*. Valvas, face ventral.
Fig. 2 — *Pseudopieris nehemia*. Apparelho genital.

b) *nehemia viridula* Feld.

(Est. 2, fig. 4).

Leptalis viridula 1861 Felder, Wien. Ent. Mon., 5, p. 75, n. 12 (Bogotá perto Muzo).
Leptalis viridula 1867 Herrich-Schäffer. Corr.-Blatt. zool.-min. Ver. Regensb., 21, p. 125.
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Pseudopieris nehemia viridula 1909. Röber *in Seitz*, Macrol. 5, p. 98
Dismorphia viridula 19.. Fassl, Int. Ent. Zeit., Frankf. Fauna Exot., n. 6-8 (p. 3).
Pseudopieris nehemia 1926 Apolinar-Maria, Bol. Soc. Col. C. Nat., 85, p. 53, n. 122.
Pseudopieris viridula 1926 Apolinar-Maria, Bol. Soc. Col. C. Nat., 85, p. 54, n. 123.

Pseudopieris nehemia viridula 1932 Talbot *in* Strand, Lep. Cat., 53, p. 25. Colombia.

Semelhante a forma especifica, com a bordadura apical e externa das azas anteriores um pouco mais larga, formando um dente logo abaixo de M 3. Face inferior destas mesmas azas marcada junto a *Cu* por uma mancha estreita e alongada de um bruno tirante ao café com leite, a qual termina depois da inserção de *Cu* 2; peito junto a base da aza com uma mancha alaranjada, base das azas posteriores com uma macula de egual côr, extremidade da CD sem macula bruna.

Var. *a* — Macho. Semelhante a *viridula*, mas a bordadura bruna das azas anteriores não apresenta dente no lado interno. Face inferior das azas anteriores sem a mancha brunacea alongada junto a *Cu*.

Esta var. confunde-se extraordinariamente com *nehemia* typica. Nosso exemplar é egualmente de Muzo.

Viridula vôa na Colombia. Nossos exemplares foram capturados pelo nosso estimado amigo Prof. Apolinar-Maria, em Muzo, no mez de Junho.

c) *nehemia aequatorialis* Feld.

(Est. 2, fig. 1)

Leptalis aequatorialis 1861 Felder, Wien. Ent. Mon., 5, p. 75. Equador.

Leptalis aequatorialis 1867 Herrich-Schäffer, Corr.-Blatt. zool.-min. Ver. Regensb., 21, p. 125.

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Pseudopieris nehemia aequatorialis 1909 Röber *in* Seitz, Macrol., 5, p. 98.

Pseudopieris nehemia aequatorialis 1918 Topp., Peru-Boliv. Bound Commission, p. 6.

Pseudopieris nehemia aequatorialis 1932 Talbot *in* Strand, Lep. Cat., 53, p. 25 (Equador, Perú).

Comprimento da aza anterior: 27 mm. Azas de um branco glauco um tanto amarellado, bem mais estreitas e alongadas do que as de *nehemia nehemia*, as anteriores com uma bordadura apical bruna relativamente larga, decrescendo bastante para a borda externa e terminando em um traço linear um pouco antes do angulo inferior. Face inferior de um branco glauco mais pronunciado do que nas outras subespecies, sem a tonalidade ocracea, o disco das anteriores esbranquiçado e o apice com a impressão da bordadura da face opposta. As maculas da base das posteriores e do peito são eguaes as de *penia*.

Vôa do Equador ao Perú e Acre, sendo desta ultima localidade o exemplar que possuimos.

d) *nehemia penia* Hopff.

(Est. 1, fig. 2; est. 2, figs. 2 e 3).

Leptalis penia 1874 Hopffer, Stet. Ent. Zg., 35, p. 334. Chanchamayo.
Moschoneura penia 1876 Druce. Proc. Zool. Soc. Lond., p. 244, n. 4, Perú: Cosnipata.
Leptalis penia 1879 Hopffer, loc. cit., 40, p. 73, n. 67.
Pseudopieris penia 1909 Röber *in* Seitz, Macrol., 5, p. 98, t. 28 e.
Pseudopieris penia 1926 Apolinar-Maria, Bol. S. Col. C. Nat., 85, p. 51, n. 124. Colombia: Villavicencio.
Pseudopieris penia 1932 Talbot *in* Strand, Lep. Cat., 53, p. 26.

Comprimento da aza anterior: 21 mm. Azas muito mais curtas e pouco mais ou menos da mesma côr das de *nehemia nehemia*, talvez de um branco um pouco menos glauco, as anteriores com a bordadura apical bruna estreita, mais larga porém do que a da forma especifica, terminando em fino traço em *Cu* 2. Face inferior semelhante a de *nehemia nehemia*, as azas anteriores com a impressão da bordadura da face opposta. Peito com uma mancha alaranjada junto a base destas azas, uma mancha de egual côr na base das posteriores, as quaes são desprovidas de mancha bruna na extremidade da CD.

Var. *a* — (Est. 2, fig. 3). Semelhante a *penia*, com a bordadura das azas anteriores muito mais estreita. Face inferior das azas anteriores com a impressão da bordadura apical da face opposta pouco nitida.

A nossa *penia* é de Chanchamayo no Perú e a var. *a* é de Quito no Equador.

Apezar de ser defficiente a descripção que Hopffer dá de *penia*, pensamos ser a subespecie aqui descripta com este nome o mesmo lepidoptero de Hopffer. Quanto a *penia* representada por Röber (*in* Seitz, Macrol.) muito se parece ella com *viridula* Felder devido a forma alongada das suas azas.

Klots considera *penia* como bôa especie, entretanto, pelo exame minucioso que fizemos na sua genitalia, não conseguimos notar qualquer differença especifica que nos pudesse servir de base para consideral-a como especie propria. Somos pois de opinião que *penia* é simplesmente uma subespecie de *nehemia*, apezar da differença na forma das suas azas. Não nos seria mesmo possivel, baseados exclusivamente neste caracter, separal-a como especie distincta sem fazer o mesmo com a *aequatorialis* de Felder, cujas azas estreitas e alongadas dão a este lepidoptero uma apparencia de especie propria, distincta de *nehemia*, mas cuja genitalia, conforme tivemos occasião de verificar, é egualmente identica a desta especie. Devemos declarar que no exame das genitalias procurámos sempre estudar, tanto quanto era possivel, a estructura interna das valvas

Pseudopieris limbalis Röb.

(Est. 2. fig. 6)

Pseudopieris limbalis 1921 Röber *in* Seitz, Macrol. 5, p. 1032, t. 192 d. Altamira no Rio Xingú.

Pseudopieris limbalis 1932 Talbot *in* Strand, Lep. Cat., 53, p. 26.

Limbalis deve ser sem duvida uma subespecie de *nehemia*, não conhecemol-a porém, por isso conservamol-a como especie propria; ella muito se parece com *penia*. Eis a descripção original:

« *Ps. limbalis* spec. nov. a été découvert par A. H. Fassl, qui nous a obligeament procuré l'exemplaire figuré, en janvier sur le rio Xingú, à Altamira. Le dessous est tout blanc, à part la tache basale jaune. Si *penia* devait être regardé comme espèce propre, il en serait de même de *limbalis* ».

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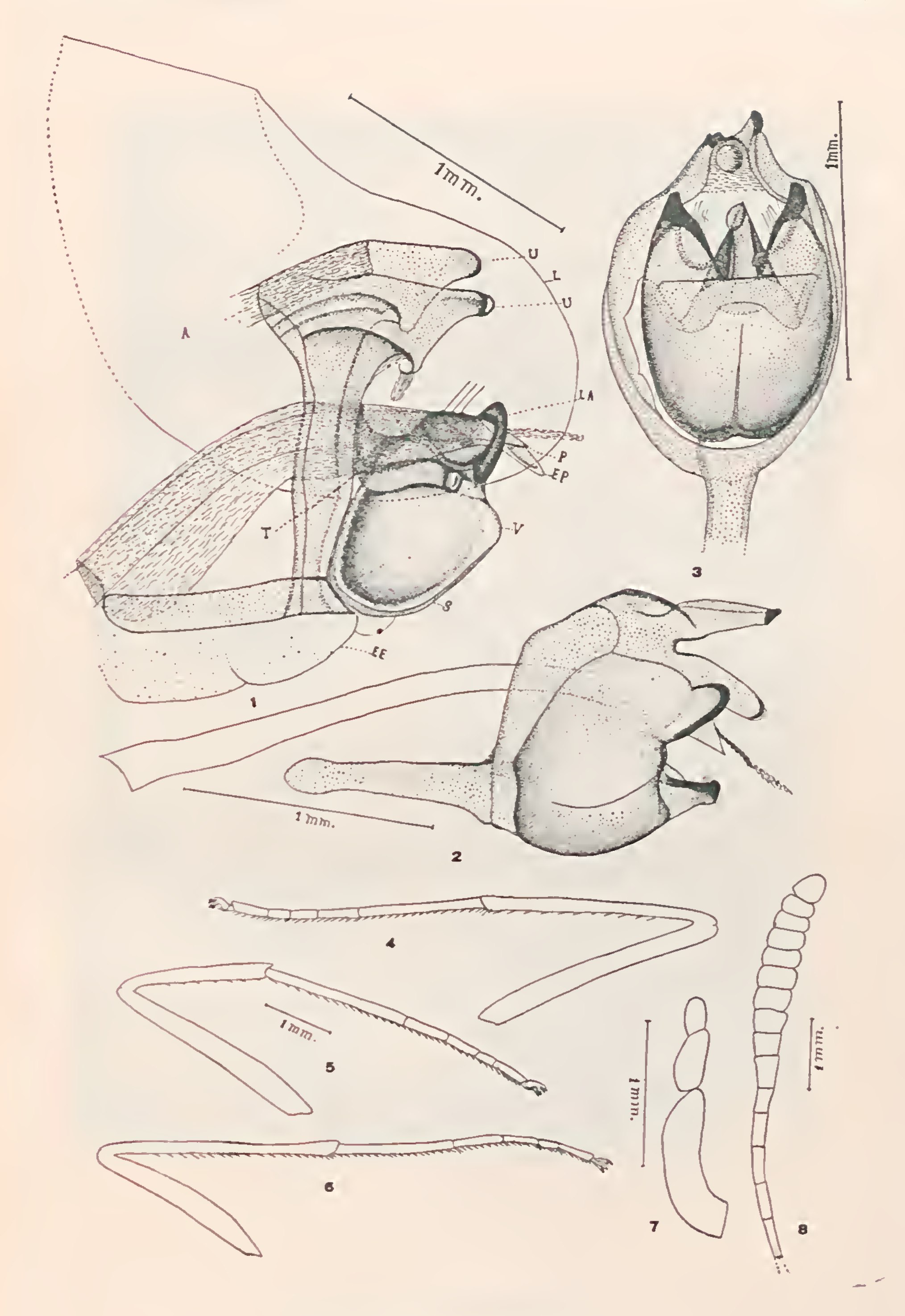
Estampa 1

Fig. 1 — *Pseudopieris nehemia*. Apparelho genital, mostrando a parte interna da valva.

U — Uncus. *L* — Lobulo do ultimo segmento abdominal. *LA* — Lobulo apical da valva. *P* — Penis. *EP* — Estojo do penis. *V* — Valva. *S* — Sutura da valva. *EE* — Ultimas esternites. *T* — Transtilla. *A* — Anus.

Fig. 2 — *Pseudopieris nehemia penia*. Apparelho genital.
Fig. 3 — *Pseudopieris nehemia*. Apparelho genital, visto pela face ventral.
Fig. 4 — *Pseudopieris nehemia*. Patas medianas.
Fig. 5 — *Pseudopieris nehemia*. Patas anteriores.
Fig. 6 — *Pseudopieris nehemia*. Patas posteriores.
Fig. 7 — *Pseudopieris nehemia*. Palpos.
Fig. 8 — *Pseudopieris nehemia*. Antenna.

Na figura 1 procurámos representar a valva como si fosse em córte longitudinal. reconhecemos porém que o desenho não reproduz fielmente a parte interna da referida valva e isso devido sobretudo a difficuldade de examinar a sua estructura atravez da outra valva que se achava superposta e que não conseguimos arrancar.

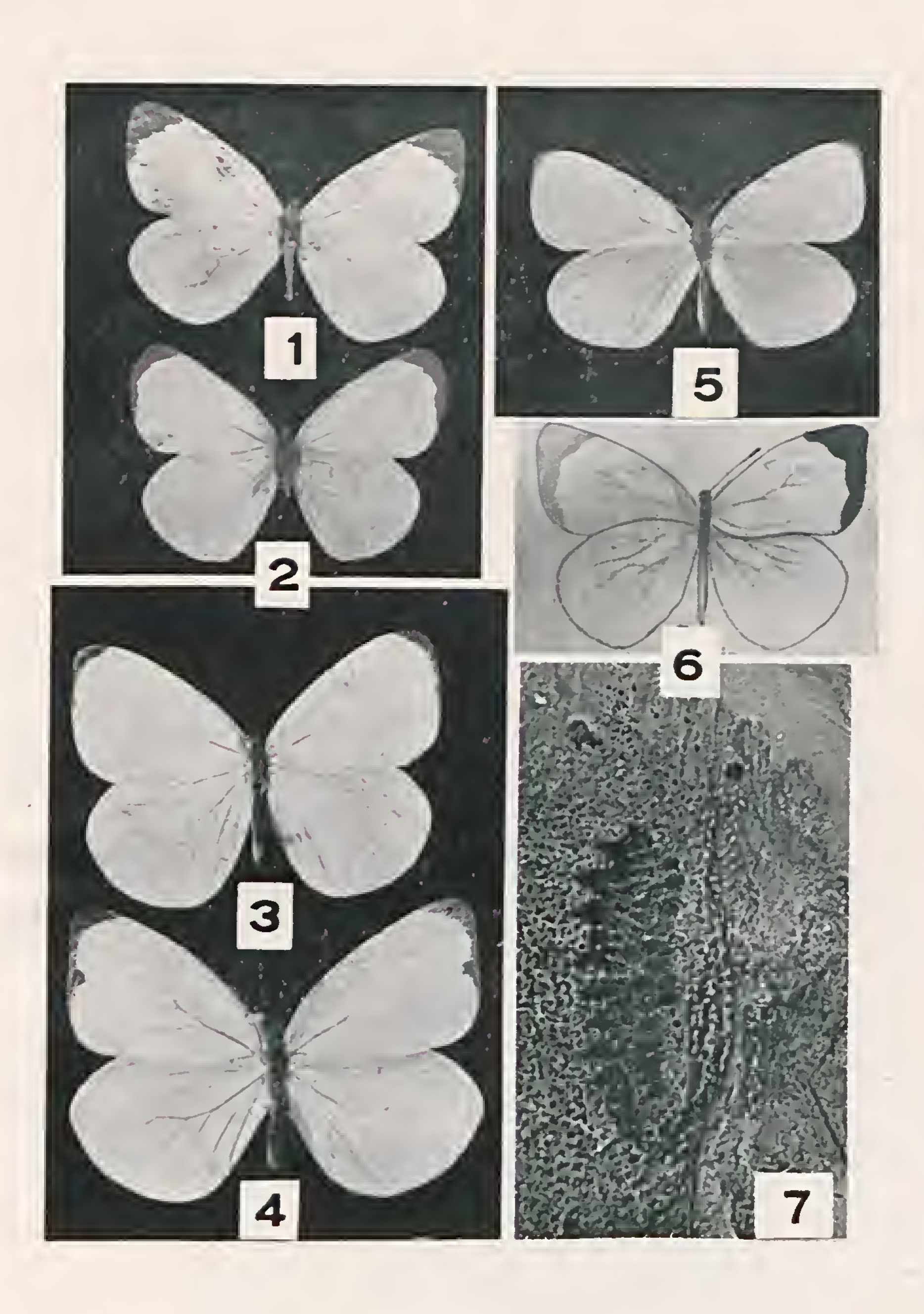


Almeida: Genero *Pseudopieris*.

Estampa 2

Fig. 1 — *Pseudopieris aequatorialis*, macho de Xapury, Acre.
Fig. 2 — *Pseudopieris nehemia penia*, macho, Chanchamayo, Perú.
Fig. 3 — *Pseudopieris nehemia penia*, macho, Quito, Equador.
Fig. 4 — *Pseudopieris nehemia viridula*, macho, Muzo, Colombia.
Fig. 5 — *Pseudopieris nehemia nehemia*, macho, Rio de Janeiro.
Fig. 6 — *Pseudopieris limbalis*, macho, segundo Röber.
Fig. 7 — *Pseudopieris nehemia nehemia*, femea, espermatheca. (Microphotographia).

M. Ventel, phot.



Almeida: Genero *Pseudopieris.*

Uma nova especie do genero Iphiclides

(Fam. Papilionidae)

R. Ferreira d'Almeida
Instituto Oswaldo Cruz, Rio de Janeiro — Brasil

[Com 3 figuras no texto]

Iphiclides travassosi sp. nov.

Muito semelhante nos desenhos e na coloração ao *Iphiclides protesilaus nigricornis* Stgr. Comprimento da aza anterior 17 mm. Antennas brunas; as faixas negras das azas anteriores são um pouco mais estreitas, das quaes a basal termina em SM., a sub basal é mais angulosa do que a do *I. embrikstrandi*



Fig. 1 — Macho de *Iphiclides travassosi*. Holotypo. M. Ventel phot.

D'Alm. (= *nigrifrons* Zik.). a terceira faixa é um pouco curva para a borda costal, a quarta reduzida a uma mancha costal, a quinta é mais estreita na sua metade posterior. Os demais caracteres como em *nigricornis*.

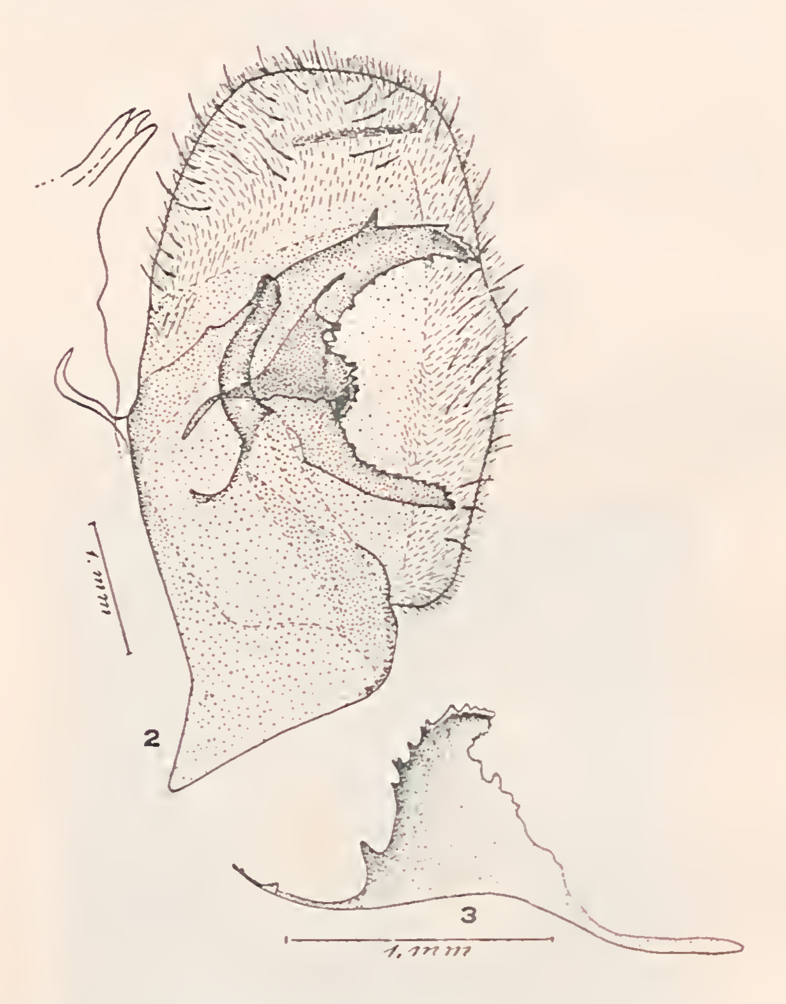


Fig. 2 — Valva de *Iphiclides travassosi*.
Fig. 3 — Crista dorsal da harpa de *Iphiclides travassosi*.

O apparelho genital apresenta ligeira semelhança com o de *embrikstrandi*, o lobulo apical da harpa não tem porém uma largura tão uniforme, ao contrario é um pouco mais estreito para a extremidade, apresentando um grande dente na borda dorsal. Processo ventral fortemente dentado, processo central egualmente dentado na extremidade, crista dorsal deslocada para o meio da harpa como em *embrikstrandi*, sendo porém muito dentada e prolongada para o apice, onde é um pouco mais estreita.

HABITAT: — Districto Federal, Rio de Janeiro, 18 de Janeiro de 1925.
HOLOTYPO: — Macho, na coll. D'Almeida.

A especie é dedicada ao grande helminthologo patricio e nosso estimado chefe, Dr. Lauro Travassos, que completa 25 annos de ininterrupto labor scientifico.

Contribuição ao conhecimento dos ofidios do Brasil

IX. Sinopse das Crotalideas do Brasil

Afranio do Amaral
Instituto Butantan, S. Paulo — Brasil

I.ª PARTE

As serpentes solenóglyphas estiveram, durante muitos annos, reunidas numa só familia, sob a denominação de *Viperidae*. Este grupo, creado em 1840 por Bonaparte (*in* Mem. Accad. Torino **2** (2 : 393), prevaleceu até os fins do seculo passado, quando Boulenger, o grande especialista do Museu Britannico, ainda o reconheceu (*in* Cat. Sn. Brit. Mus. **3** : 463 *et* 518, 1896) como uno. Isto occorreu, apezar de varios autores já haverem precedentemente proposto, em termos acceitaveis pelas Regras Internacionaes de Nomenclatura Zoologica, a divisibilidade do alludido grupo em 2 familias bem distinctas. Assim é que para uma destas Fitzinger, em 1843 (*in* Syst. Rept. : 28), creara o nome *Chersophes* e, para a outra, a denominação *Bothrophes*. Sem fallar em outras designações que não podem ser reconhecidas pelo codigo internacional de nomenclatura, diversos nomes foram applicados a estas 2 familias. Delles, *Viperidae* e *Crotalidae*, creados por Cope, respectivamente, em 1859 (*in* Proc. Acad. Nat. Sc. Philadelphia : 333) e 1861 (*in loc. cit.* : 231) receberam, durante muito tempo, a preferencia dos herpethologos. As 2 familias *Viperidae* e *Crotalidae* incluiam grande numero de formas que facilmente se reunem nos 2 distinctos grupos correspondentes, a saber:

A. Fosseta lacrimal ausente; osso maxillar não escavado em cima ... 1.ª familia.

B. Fosseta lacrimal presente; osso maxillar escavado em cima ... 2.ª familia.

Sob o ponto de vista da systematica, estes 2 grupos poderiam ficar subordinados a uma superfamilia, caracterizada pela verticalidade dos ossos maxillares e para a qual seria cabivel o nome *Crotaloideae*, proposto por Stejneger (*in* Bull. 58 U. S. Nat. Mus. : 256, 1907). Cabe, porém, accentuar que Stejneger, ao erigir aquella superfamilia, mostrara (*in loc. cit.* : 142) que a denominação *Viperidae* não podia prevalecer na nomenclatura, porque o nome generico *Vipera*, que lhe dera origem, fora creado somente em 1768 por Laurentius (*in* Syn. Reptilium : 99) e é synonymo de *Coluber*, creado por Linneu (*in* Syst. Nat. **1** : 216, 1758) com antecedencia de uma decada. Sem embargo disto e em virtude da confusão que resultaria da fixação do nome *Coluber* como typo dessa familia de serpentes solenóglyphas (a qual teria de receber a denominação de *Colubridae*, já preoccupada por um grupo de serpentes desprovidas de presa inoculadora), Stejneger creou o nome *Cobridae*, cujo genero typico é

Cobra Laurentius, 1768 (*in loc. cit.* : 103), tomado, *in sensu strictiore*, como synonymo de, e preexistente a, *Bitis* Gray, 1842 (*in* Zool. Miscell. : 25 *et* 69).

Dessa discussão da materia resulta que as serpentes solenóglyphas (superfamilia *Crotaloideae*), caracterizadas pela posse de maxillares verticaes, se agrupam em 2 familias, a saber:

A. Fosseta lacrimal ausente; osso maxillar não escavado em cima *Cobridae*.

B. Fosseta lacrimal presente; osso maxillar escavado em cima *Crotalidae*.

Destas familias, a 1.ª (*Cobridae*) não tem representantes no hemispherio occidental, isto é, nas regiões nearctica e neotropica. A 2.ª (*Crotalidae*), todavia, é quasi caracteristica desta parte do mundo, porque, embora possua representantes em outras regiões, a maioria destes occorre nas Americas.

A familia *Crotalidae* subdivide-se, em 2 sub-familias, reconhecidas desde Cope (*in* Rept. U. S. Nat. Mus. : 1131. 1898), assim:

a) presença de appendice caudal articulado (crepitaculum) *Crotalinae*.

b) ausencia de appendice caudal articulado *Lachesinae*.

Não só na região neotropica, como na região nearctica, occorrem representantes destes 2 subgrupos.

Da subfamilia *Crotalinae* fazem parte dois generos, assim reconheciveis:

1. Topo da cabeça coberto de escamas maiores ou menores, algumas escutiformes *Crotalus* Linneu, 1758.

2. Topo da cabeça coberto de escudos bem configurados *Sistrurus* Garman, 1883.

Do genero *Crotalus*, que é peculiar ao hemispherio occidental, occorrem representantes nas duas regiões, neotropica e nearctica. O genero *Sistrurus* é por bem dizer typico da região nearctica, pois apenas uma de suas especies (*S. ravus*) se encontra no Mexico oriental e, pois, bem pouco para fóra da divisa meridional, aliás pouco nitida, daquella zona.

A subfamilia *Lachesinae* comprehende tres generos, que assim se distinguem:

1. Topo da cabeça coberto de escudos bem configurados *Agkistrodon* Beauvois, 1799.

2. Topo da cabeça coberto de escamas ou escudos irregulares:

   2 a. Escamas supracephalicas granulosas; escamas dorsaes com carena tubercular; escamas da ponta da cauda longas e espinhosas *Lachesis* Daudin, 1803.

   2 b. Escamas supracephalicas chatas e carinadas; escamas dorsaes com carena mais ou menos alongada; escamas da ponta da cauda não distinctas das demais *Bothrops* Wagler, 1824.

Por mero desconhecimento da materia, muitos autores confundem sob a só denominação de *Lachesis* as fórmas componentes dos 2 ultimos generos acima, os quaes, segundo mostrei em 1926 (*in* Rev. Mus. Paulista **14** : 39-40), se apartam fundamentalmente ainda pelos seguintes caracteres, de indiscutivel valor taxonomico:

a) Dentes pterigoideos, cuja série ultrapassa a articulação transverso-pterigoidea nas especies de *Bothrops* e não a ultrapassa na especie unica de *Lachesis*;

b) Pulmão tracheal, que occorre nas varias especies de *Bothrops* e não comparece, nem sob forma vestigial, na especie unica de *Lachesis*;

c) Systema de reproducção, que é ovo-viviparo nas varias especies de *Bothrops* e oviparo na especie unica de *Lachesis*, segundo mostrei em 1927 (*in* Rev. Mus. Paulista **15** : 43-45).

Á luz da systematica é, portanto, erro, e erro crasso, incluir no genero *Lachesis* certas serpentes solenóglyphas, como a Jararaca, a Jararacussú, a Urutú e outras especies affins, cujos caracteres satisfazem, no mais alto grau, á definição de *Bothrops*.

II.ª PARTE

Esclarecidos, desse modo, os pontos mais importantes da systematica das Crotalideas em geral, passamos a assignalar synopticamente a differenciação das especies occorrentes no Brasil:

DEFINIÇÃO

Serpentes relativamente grossas, de escamas asperas, de cabeça distincta (bem mais larga do que o pescoço), de cauda curta, de pupilla vertical (conformada á vida nocturna), providas de 2 grandes presas moveis na parte antero-superior da bocca e caracterizadas particularmente, assim pela presença de escavação superior nos ossos maxillares, como pela posse de um orificio (fosseta lacrimal) entre a narina e a orbita, á maneira de uma narina supplementar de cada lado, donde decorre a denominação de «cobras de 4 ventas», que lhes dá o povo.

DIFFERENCIAÇÃO

†. Presença de appendice caudal articulado (*crepitaculum*): chocalho ou guizo — sub-fam. *Crotalinae*:

1. Topo da cabeça com escamas irregulares, ás vezes escutiformes sobre o focinho — gen. *Crotalus* Linneu, 1758:

Especie unica no Brasil — *C. terrificus* (Laurentius, 1768).

Nota: Esta especie é representada no Brasil pela raça *Crotalus terrificus terrificus*, da qual, em 1927, (*in* Rev. Mus. Paulista **15** : 89-91) registei duas variedades, a saber:

a) marcas nucaes sob a forma de losangos *collirhombeatus*

b) marcas nucaes sob a forma de 2 faixas lineares longitudinaes *collilineatus.*

NOMES VULGARES: — Cascavel; Cascavel de quatro ventas (nordeste); Boicininga ou Boiçununga e Maracá (Amazonia), Boiquira (sul), Maracaboia (centro).

DISTRIBUIÇÃO GEOGRAPHICA: — Forma commum a todas as zonas seccas do paiz, especialmente abundante no centro e nordeste e relativamente rara no extremo sul.

A esta sub-differenciação, que parece ainda estar em vias de constituição, corresponde um caracter chromatico predominante no veneno de cada uma dellas: a raça *collirhombeatus*, que occorre sobretudo no nordeste, possue um veneno *quasi sempre* amarellado, ao passo que a variedade *collilineatus*, que se encontra sobretudo no sul, apresenta um veneno de côr *quasi sempre* esbranquiçada. Sendo a côr do veneno funcção de sua composição chimica (segundo mostrei *in* Bull. Antivenin Inst. of America **3** : 7. 1929), pode-se acceitar a forma nordestina como uma especie physiologica, bem distincta da especie physiologica representada pela forma meridional.

++. Ausencia de appendice caudal articulado sub-fam. *Lachesinae:*

I. Topo da cabeça com escamas granulosas; escamas dorsaes com carena tubercular, escamas da ponta da cauda longas e espinhosas gen. *Lachesis* Daudin, 1803.

Especie unica do genero *L. muta* (Linneu, 1766).

NOMES VULGARES: — Surucucú (Amazonia e centro), Surucucú de fogo (nordeste), Surucucú pico de jaca (Bahia), Surucutinga ou Surucucutinga (centro e sudeste).

DISTRIBUIÇÃO GEOGRAPHICA: — Especie encontrada na região propriamente tropical, onde habita as mattas e florestas.

II. Topo da cabeça com escamas chatas e carinadas; escamas dorsaes com carena alongada; escamas da ponta da cauda não distinctas das demais gen. *Bothrops* Wagler, 1824.

II A. Cauda prehensil:

1. — Placas subcaudaes quasi todas inteiras, em numero de 56 a 71; colorido do dorso verde, com uma série de pintas amarello-avermelhadas de cada lado da linha vertebral e com uma lista punctiforme de côr amarella de cada lado do ventre.
B. bilineata (Wied, 1825).

NOMES VULGARES: — Surucucú de patioba, Surucucú de pindoba e Patioba (sul da Bahia). Ouricana e Uricana e Surucucú pinta de ouro (sertão da Bahia). Jararaca verde (centro até Espirito Santo).

DISTRIBUIÇÃO GEOGRAPHICA: — Especie dendricola, propria á Bahia e outros districtos da zona hygrophyta tropical.

II B. Cauda semi-prehensil.

1 — Placas subcaudaes quasi todas inteiras, em numero de 71 a 83; colorido do dorso cinzento com faixas transversaes castanho-escuras, bifidas e a terminarem em 2 pontos negros de cada lado; colorido do ventre pardacento com manchas amarellas um pouco esparramadas sobre os flancos *D. castelnaudi* D. & B., 1854

DISTRIBUIÇÃO GEOGRAPHICA: — Especie rara, dendricola accidental, procedente das zonas septentrional e centro-occidental.

2 — Placas subcaudaes divididas em geral, mas com nitida tendencia á união, em numero de 18 a 65; colorido do dorso pardo-amarellado, com marcas lateraes subtriangulares ou irregulares e com o centro claro *B. insularis* (Amaral, 1921).

NOME VULGAR: — Jararaca ilhôa.

DISTRIBUIÇÃO GEOGRAPHICA: — Especie semi-dendricola, confinada á Ilha da Queimada Grande (littoral de S. Paulo).

II C. Cauda não prehensil:

II C' — Placas subcaudaes quasi todas divididas:

II C' a. — Borda anterior da fosseta lacrimal formada pela 2.ª supralabial:

1. — Supralabiaes geralmente 7; escamas dorsaes fortemente carinadas (carena curta e subtubercular) em 23 a 33 filas; ventraes 180 a 231; colorido do dorso roseo-pardacento com estreitas manchas lateraes angulares, ligadas de leve a 2 pintas negras paraventraes
B. atrox (Linneu, 1758).

NOMES VULGARES: — Caissaca (nordeste) e Jararaca (norte).

DISTRIBUIÇÃO GEOGRAPHICA: — Especie terrestre encontrada em toda a zona tropical até S. Paulo.

2. — Supralabiaes 8; escamas dorsaes fortemente carinadas, em 25 filas; ventraes 161; colorido do dorso cinzento amarellado com estreitas manchas lateraes angulares, ligadas de leve a 2 pintas negras paraventraes ... *B. neglecta* Amaral, 1923.

DISTRIBUIÇÃO GEOGRAPHICA: — Especie terrestre, oriunda da Bahia.

3. — Supralabiaes geralmente 8; escamas dorsaes fracamente carinadas (carena longa e baixa), em 20 a 27 filas; ventraes 175 a 216; colorido do dorso verde-olivaceo, com estreitas manchas lateraes subtriangulares ou irregulares, geralmente confluentes com 2 pintas negras paraventraes ... *B. jararaca* (Wied, 1824).

NOMES VULGARES: — Jararaca, Jaraca ou Jaracá, Jararaca dormideira, Jararaca preguiçosa, Jararaca da matta virgem, Jararaca do cerrado e Jararáca do campo.

DISTRIBUIÇÃO GEOGRAPHICA: — Especie terrestre, distribuida da Bahia para o sul e communissima especialmente no Paraná e Santa Catharina.

NOTA: — Segundo mostrei alhures (*in* Contrib. Harvard Inst. Trop. Med. and Biol., **2** : 26, 1925), a nossa Jararaca foi confundida com a Fer-de-lance da Martinica por Boulenger (*in* Cat. Sn. Brit. Mus., **3** : 535, 1896) sob o nome de *Lachesis lanceolatus*, o que levou muitos autores, mesmo brasileiros, a lhe applicarem este nome. Ora, como a serpente da Martinica (*lanceolatus*), descripta por Lacepède em 1789, é um estricto synonymo da especie *atrox*, descripta por Linneu em 1758 e á qual corresponde a nossa Caissaca, cuja nitida separação da Jararaca foi entre nós de ha muito estabelecida, não se comprehende a razão de se terem aqui applicado a estas especies dois nomes scientificos, que afinal representam uma só e mesma forma. Denominar a nossa Jararaca de *Lachesis lanceolatus* é imperdoavel, porquanto não corresponde á especie *lanceolatus* (= *atrox*), nem se pode ligar ao genero *Lachesis*.

4. — Supralabiaes geralmente 8; escamas dorsaes nitidamente carinadas (carena sublonga e alta) em 23 a 27 filas; ventraes 170 a 186; colorido do dorso amarello-escuro com largas (bem abertas) manchas lateraes ligadas de leve a (jovens), ou confluentes com (adultos), 2 pintas negras paraventraes, em forma de  ... *B. jararacussu* Lacerda, 1884.

NOMES VULGARES: — Jararacussú ou Jararacussú verdadeiro, Jararacussú malha de sapo, Cabeça de sapo ou Patrona (Bahia e nordeste), Jararacussú ou Surucucú tapete, Urutú dourado, preto, amarello ou estrella e Surucucú dourado (Rio de Janeiro e sudeste de Minas Geraes).

DISTRIBUIÇÃO GEOGRAPHICA: — Especie semi-aquatica, encontradiça á beira de brejos e correntes nas zonas baixas desde o littoral do sul e leste até o centro-oeste.

5. — Supralabiaes 8; escamas dorsaes nitidamente carinadas (carena longa e alta) em 27 filas; ventraes 161 a 167; colorido do dorso amarello-pardacento com estreitas manchas lateraes em forma de ⅄, confluentes as 2 pintas paraventraes, assim: 

B. pirajai Amaral, 1923.

DISTRIBUIÇÃO GEOGRAPHICA: — Especie procedente do sul da Bahia.

II C' b. Borda anterior da fosseta lacrimal separada da 2.ª supralabial.

1. — Supralabiaes 8 a 11; escamas dorsaes distinctamente carinadas (carena longa e baixa) em 29 a 35 filas; ventraes 165 a 190; colorido do dorso pardacento com grandes ocellos lateraes em forma de por vezes confluentes longitudinal ou transversalmente; topo da cabeça anegrado com um desenho esbranquiçado em forma de mais ou menos irregular, ao centro

B. alternata D. & B., 1854.

NOMES VULGARES: — Urutú, Cruzeiro ou Cruzeira, Cotiara ou Coatiara e Jararaca rabo de porco (extremo sul) ou Jararaca de agosto (região da Lagôa dos Patos).

DISTRIBUIÇÃO GEOGRAPHICA: — Especie terrestre, propria da zona serrana, desde o sudeste de Minas Geraes, atravez de S. Paulo e até Rio Grande do Sul.

2. — Supralabiaes 8 a 9; escamas dorsaes distinctamente carinadas (carena longa e baixa), geralmente em 27 filas (25 a 29); ventraes 152 a 165; colorido do dorso verde olivaceo com manchas lateraes pardo-negras subtriangulares em  ou Λ aberto, cada ponta correspondente e superposta a uma pinta negra paraventral 

topo da cabeça anegrado, com um desenho esverdeado claro, em forma de dupla cruz, mais ou menos irregular, ao centro
B. cotiara (Gomes, 1913).

NOMES VULGARES: — Cotiara ou Coatiara, Boicotiara (S. Paulo e Paraná), Jararaca preta (centro de Santa Catharina).

DISTRIBUIÇÃO GEOGRAPHICA: — Especie terrestre, encontrada na zona serrana do sudeste de Minas Geraes, sudoeste do Rio de Janeiro e nordeste de S. Paulo e, depois, do Paraná para o sul.

3. — Supralabiaes 8; escamas dorsaes distinctamente carinadas (carena longa e baixa) em 25 a 27 filas; ventraes 150 a 160; focinho não truncado, nem recurvo; colorido do dorso roseo ou tijolo com series de pintas lateraes negras, simples ou duplas e superpostas; topo da cabeça rubro-pardo, geralmente com manchas anegradas, sendo 1 impar, anterior sobre o focinho (inter-cantal) e 2 ou 3 pares posteriores, geralmente fundidos em forma de uma estria parietal de cada lado *B. itapetiningae* (Boulenger, 1907).

NOME VULGAR: — Cotiarinha.

DISTRIBUIÇÃO GEOGRAPHICA: Especie propria ao interior de São Paulo e Paraná.

4 — Supralabiaes 7 a 8; escamas dorsaes distinctamente carinadas (carena longa e baixa), em 19 a 21 series; ventraes 139 a 158; focinho algo truncado e recurvo para cima; colorido do dorso pardo avermelhado, com manchas lateraes escuras, triangulares, proximas entre si; topo da cabeça pardo com 1 faixa clara transversal sobre o focinho e 1 marca tambem clara, em forma de 8 irregular, na região fronto-parietal *B. erythromelas* Amaral, 1923

DISTRIBUIÇÃO GEOGRAPHICA: Especie terrestre, propria dos districtos aridos da zona nordestina (da Bahia ao Ceará).

5. — Supralabiaes 8 ou 9, sendo mais longa a 4.ª; escamas dorsaes distinctamente carinadas (carena longa e baixa), em 21 a 25 series; ventraes 160 a 170; focinho semi-pontudo; subocular separada das supralabiaes por 1 serie de escamas; colorido do dorso pardo com faixas transversaes escuras; topo da cabeça escuro com uma pinta clara irregular sobre a coroa *B. iglesiasi* Amaral, 1923.

DISTRIBUIÇÃO GEOGRAPHICA: — Especie procedente do sertão do Piauhy.

6 — Supralabiaes 8 a 9, sendo mais longas a 3.ª e 4.ª; escamas dorsaes distinctamente carinadas (carena longa e baixa), em 21 a 27

series; ventraes 163 a 187; focinho semi-pontudo; subocular separada das supralabiaes por 2 a 3 series de escamas; colorido do dorso variavel, desde o oliva ao roseo, com manchas lateraes irregulares, escuras e tarjadas de branco, oppostas, alternadas ou confluentes ás do outro lado e rodeadas de pintas (manchas menores) de egual colorido; topo da cabeça pardacento com 3 a 5 marcas, sendo 1 impar sobre o focinho (inter-cantal) e 1 a 2 pares parietaes (ás vezes fundidos), negras, tarjadas de branco
B. neuwiedii Wagler, 1824.

NOTA: — Segundo mostrei recentemente (*in* Contrib. Harvard Inst. Trop. Biol. & Med. **2** : 56-62, tabs. XIII-XVI, 1925; Mem. Inst. Butantan **4** : 111-115 *et* 237-239, 1930 *et* **10** : 158-160, 1936), a especie *B. neuwiedii* é subdivisivel em varias raças geographicas, distribuidas pelos differentes districtos do Brasil, com excepção apenas do valle amazonico, onde a especie ainda não foi assignalada.

NOMES VULGARES: — Jararaca ou Jararaca de rabo branco (São Paulo até o extremo sul), Bocca de sapo (Matto Grosso), Rabo de osso (Goyaz) e Tira peia (nordeste).

Novo ciliado encontrado no escarro humano:

Prototravassosia costai, g. n., sp. n. (Ciliata)

Paulo de Toledo Artigas
Assistente do Instituto Butantan, Prof. da Fac. de Pharm. e Odont. de São Paulo — Brasil

e

Ovidio Unti
Assistente da Fac. de Pharm. e Odont. de São Paulo — Brasil

[Com 1 estampa]

A verificação de ciliados observados em fezes humanas não é um facto raro. Assim é que varios ciliados attribuidos aos generos *Colpoda* D. F. Müller 1773, *Uronema* Dujardin, 1841, *Chilodon* Ehrenberg, 1833, *Balantidium* Claparede e Lachmann, 1855 e *Nyctotherus* Leidy, 1849 teem sido observados em exames de fezes. Talvez, com excepção da especie *Balantidium coli* (Malmsten, 1857), todos os demais ciliados encontrados em exames de fezes do homem, nada mais sejam do que protozoarios saprozoicos, contaminando accidentalmente o material fecal, ou ahi se desenvolvendo após passagem incolume pelo tubo intestinal, na forma encystada.

Ao contrario do que ahi vae referido, é facto virgem a verificação de um ciliado, quer verdadeiramente parasito, quer simples saprozoito, na cavidade buccal e no apparelho respiratorio do homem. Desta particularidade é que nos pareceu interessante trazer a publico a nossa verificação de um ciliado observado no escarro de uma mulher padecendo de uma syndrome pulmonar de causa etiologica obscura.

Em Junho do anno proximo passado, recebemos do Dr. Vasco Ferraz da Costa, medico interno do Hospital da Santa Casa, dois tubos de meio de Sabouraud semeados em escarro de uma doente internada em consequencia de molestia do apparelho respiratorio e com signaes clinicos de tuberculose. Nessa doente todos os exames visando encontro do *Mycobacterium tuberculosis*, bem como inoculações do escarro em cobaio, foram negativos quanto á affirmativa de se tratar de uma infecção determinada pelo bacillo de Koch.

Examinando os tubos enviados pelo Dr. Vasco Ferraz da Costa, notamos uma cultura formando inducto humido, espesso, ligeiramente acinzentado e continuo. Preparados feitos entre lamina e lamina fizeram-nos ver que a cultura era de uma bacteria bacillar volumosa; além dessa bacteria pudemos observar um grande numero de ciliados em pleno desenvolvimento e vitalidade no meio bacteriano. A bacteria encontrada, que era um germe esporulado e gram positivo, não nos interessou particularmente, pelo que não foi tentado o seu diagnostico. Achamos, porém, curioso o facto da existencia do ciliado que apparecia em symbiose com a cultura bacteriana.

Trabalho do Instituto Butantan.

O escarro semeado havia sido colhido em placa de Petri esteril, após a doente haver lavado a bocca, cuidadosamente, com solução de chlorato de potassio.

Esse encontro de um protozoario, possivelmente oriundo do escarro, levou-nos a verificar a sua presença em material recente. O exame feito, dois dias depois das semeaduras acima referidas, permittiu observar em um preparado a fresco, entre lamina e laminula, em seis examinados, a presença de dois exemplares do ciliado já encontrado nas culturas. Ficou, assim, provada a proveniencia indiscutivel daquelle protozoario, e, desta forma, constatada, talvez, pela primeira vez, a existencia de um ciliado capaz de permanecer em condições de vitalidade no apparelho respiratorio humano.

Nas culturas foi-nos dado observar a possibilidade de se manter a symbiose da bacteria e do protozoario em quatro repiques successivos, feitos com intervallos de sete dias.

Trata-se a nosso ver de um interessante caso de saprozoismo, pois desde a nossa verificação até agora não mais encontramos o ciliado em varios exames feitos, inclusive um material obtido por meio de sondagem bronchoscopica. Não ha duvida, porém, de que o ciliado encontrado poude se manter em plena vitalidade no organismo humano, durante um periodo de tempo não conhecido mas, seguramente, superior a dois dias.

Até a presente data a doente se mantem em estado estacionario, quanto á evolução da sua syndrome pulmonar; actualmente os clinicos tendem pela affirmativa de se tratar de uma bronchospirochetose. De nosso lado, continuamos a pesquizar o ciliado, embora crentes de se tratar, neste particular, de um mero caso de saprozoismo protozoarico.

O ciliado encontrado, para o qual propomos a denominação de *Prototravassosia costai*, homenageando o prof. Lauro Travassos e o Dr. Vasco da Costa, apresenta os seguintes caracteres:

Prototravassosia n. g.

Astomatea; ciliado de corpo ovalar, achatado, regularmente recoberto de cilios e sem cytostoma, cytopygio e vacuolos pulsateis. Corpo com numerosos vacuolos alimentares.

Prototravassosia costai n. sp.

Protozoarios ciliados de forma ovalar, medindo, em media 50 × 38 micra. O corpo se apresenta uniformemente recoberto de cilios dispostos em fileiras. Não se nota uma differenciação nitida de endo e ectoplasma. No cytoplasma notam-se numerosas formações circulares, contendo, dentro de um todo claro, uma formação granulosa: essas formações parecem ser vacuolos alimentares. Não se observaram cytostoma, cytopygio nem tampouco vacuolos pulsateis. O nucleo (macronucleo) se apresenta no interior de um lado claro; é mais ou menos ovalar nas formas vegetativas e de contorno um tanto irregular; apresenta uma membrana peripherica e uma massa interna coravel pela hematoxylina. O micronucleo nunca foi observado, quer nos exemplares vistos á fresco, quer em material corado. Foi visto com minucia o processo de multiplicação por divisão binaria; nota-se um progressivo alongamento do nucleo (macronucleo),

emquanto um estrangulamento vae constringindo a parte média do corpo; ao fim de um certo periodo o nucleo (macronucleo) se divide em dois, ao mesmo tempo que, por scisão transversal, o corpo tambem se divide. Diversas phases dessa multiplicação estão representadas nas figuras da estampa.

Quanto á posição systematica, esta nova especie de protozoario tem que ficar situada na sub-ordem *Astomatea* Schwiakoff, a menos que, caso torne a ser encontrada, o seu estudo cytologico venha a demonstrar a inexistencia do micronucleo. Neste caso, *Prototravassosia costai* seria um typo de ciliado formando o elo de ligação entre os *Protociliata* e os *Euciliata*. A creação de um genero para esta especie é necessaria, sobretudo pelo facto de na sub-ordem *Astomatea* não haver outro ciliado que apresente uma identidade de caracteres que permitta uma approximação generica.

As laminas coradas que serviram de base para a presente descripção se encontram em poder do autor senior do trabalho.

RESUMO

Assignala-se neste trabalho a presença de um ciliado no apparelho respiratorio de uma mulher com uma syndrome de causa etiologica obscura.

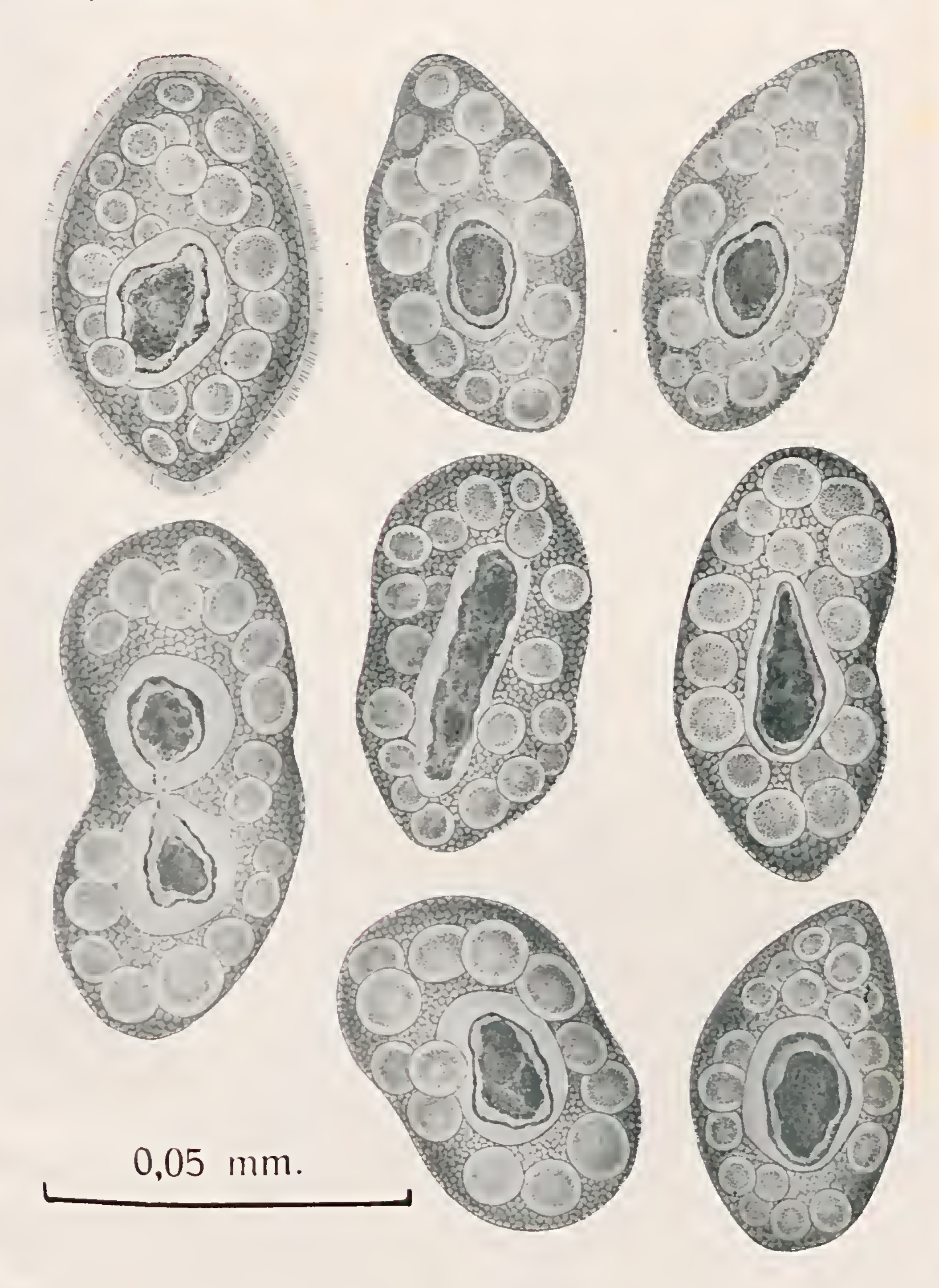
Esse protozoario é descripto e para elle é proposta a denominação *Prototravassosia costai* g. n. e sp. n.

ABSTRACT

A ciliate protozoon has been found in the sputum of a woman with a not clearly diagnosticated pulmonary disease. This ciliate has been observed in cultures and in direct fresh preparations. As it is a new species and a new genus, the name *Prototravassosia costai* is then proposed.

Estampa 1

Os desenhos foram feitos com camara clara e representam exemplares de laminas coradas com a hematoxylina ferrica de Heidenhain. Os cilios foram omittidos pelo facto de terem sido preferidas para desenhar laminas em que o processo de differenciação tenha sido sufficiente para uma perfeita observação do protozoario; nesses preparados os cilios são muito pouco visiveis. De uma lamina, mais intensamente corada, desenhou-se um exemplar com os respectivos cilios. Na serie de desenhos podem-se apreciar os diversos aspectos do nucleo no processo de divisão binaria, bem como a divisão do corpo do ciliado.



Artigas & Unti: Novo ciliado.

Da Biologia dos Peixes Nordestinos.
(Fragmento Biocenotico)

Pedro de Azevedo
Commissão Technica de Piscicultura do Nordeste — Brasil

Com a presente recapitulação das observações ecologicas referentes aos peixes dos arredores de Fortaleza, queremos pôr em evidencia certos factores que dizem respeito á biocenose nas aguas nordestinas, tomando por base a ichthyofauna. A interdependencia das especies é, sem duvida, um dos problemas basicos para a bôa orientação dos trabalhos de piscicultura; ao mesmo tempo tal apreciação, que considera como unidades os differentes biotopos, habilita-nos a distinguir os factores do ambiente de influencia decisiva. Desta forma, a biosociologia, resultante, em ultima analyse, das possibilidades que o ambiente proporciona aos seres, nos informa sobre a chorologia e a chronologia de epocas anteriores desta região.

Não basta, para o estudo da zoogeographia, confrontar a distribuição actual das especies; é preciso levar em consideração as possibilidades que outrora o ambiente proporcionava ás especies do grupo estudado. E se queremos indagar, por exemplo, da paleometeorologia do Nordeste, certamente as evidencias indirectas do estudo que fazemos, tem valor comprovante.

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Para pôr em evidencia as affinidades naturaes das especies mais communs das aguas de Fortaleza e de suas cercanias, reunimol-as no quadro abaixo:

Teleostei.
- Symbranchii — Symbranchidae — *Symbranchus marmoratus* = mussum.
- Haplomi — Cyprinodontidae — *Poecilia vivipara* = guarú.
- Acanthopterygii — Cichlidae.
  - *Cichlasoma bimaculatum* = acará.
  - *Crenicichla wallacii* (?) = jacundá.
- Ostariophysi.
  - Characidae.
    - Curimatinae — *Curimatus elegans* = saguirú.
    - Prochilodinae — *Prochilodus argenteus* = curimatã.
    - Anostomatinae — *Leporinus* = piáu.
    - Tetragonopterinae — *Astyanax* *bimaculatus*, *taeniatus*, *hemigrammus* = piábas
    - Narnostomatinae — *Characidium fasciatum* = charuto.
    - Erythrininae.
      - *Hoplias malabaricus* = trahira.
      - *Hoplerythrinus unitaeniatus* = jejú.
  - Nemathognathii.
    - Trachycoristidae — *Trachycoristes striatulus* = cangaty.
    - Loricariidae — *Plecostomus plecostomus* = cascudo.

Se examinarmos um açude das proximidades de Fortaleza, com mais ou menos um hectare de superficie e que seja optimo para a creação do peixe, podemos encontrar as especies que se seguem, mais ou menos na seguinte proporção numerica:

Aguas profundas		*Aguas razas*	
Curimatã	3.000	Guarú	12.000
Piábas	2.000	Piábas	10.000
Trahira	600	Acará	2.000
Piáu	400	Saguirú	1.200
		Trahira (sovela)	500

Aguas menos profundas		*Total*	
Piábas	4.000	Piába	16.000
Acarás	1.680	Guarú	12.000
Saguirú	1.200	Curimatã	4.000
Trahira	1.000	Acará	3.680
Curimatã	1.000	Saguirú	2.400
Cangaty	800	Trahira	2.100
Cascudo	600	Cangaty	800
Piáu	200	Piáu	600
		Cascudo	600
		Charuto, Jacundá Mussum, etc.	80
			42.266

Vejamos agora se o conhecimento dos habitos de vida dessas especies, os caracteristicos da sua procreação e os seus processos de disseminação nos permittem explicar esse equilibrio em tal biotopo.

Piabas: — O objectivo deste trabalho não comporta considerações minuciosas em torno das varias especies de piábas existentes nesta região e por isso vamos apresentar aqui dados geraes applicaveis á maioria dellas. São peixes de pequeno porte, muito ageis, omnivoros com tendencia alimentar para os insectos (larvas, etc.), vivem optimamente em qualquer ambiente, defendendo-se muito bem dos seus inimigos naturaes. Num aquario onde haja varias trahiras, é interessante observar como uma piába, nelle lançada, se defende com rapidez e mesmo com elegancia, dos botes daquelles peixes vorazes. Em agua livre, só por excepção poderá uma trahira apanhar uma piába.

Os caracteristicos especiaes da sua desova concorrem para a grande efficiencia da mesma. A piába, em proporção ao seu pequeno tamanho, apresenta uma quantidade de ovulos bastante grande, bem maior que a da curimatã, pois uma piába de 10 grs. de peso possue approximadamente 10.000, ao passo que uma curimatã de 2.700 grs. tem apenas 1.150.000 ovulos, quando na mesma proporção deveria ter 2.700.000. Além de ser tão avultado o numero de ovulos, estes são adhesivos, isto é, ao cahir sobre as folhas das plantas prendem-se a ellas. Nestas condições, em aguas ligeiramente correntosas e limpas, como costumam ser as das cabeceiras dos riachos, onde as piábas desovam, a evolução se faz muito melhor do que se fossem lançados a esmo, como acontece com os da curimatã. Além disto, desovando ella parcialmente, isto é, varias vezes durante uma determinada época, haverá sempre opportunidade para maior apro-

veitamento da desova, ao contrario de outras especies, que tudo jogam numa só cartada. Em cada desova parcial, as femeas só se utilizam de uma determinada porção de ovulos maduros, assim como os machos emittem apenas a quantidade necessaria de esperma, continuando as gonadas mais ou menos cheias, á espera de nova desova.

A disseminação desta especie se faz com facilidade extrema: qualquer filete de agua pode ser galgado pela piába e dahi a sua vasta distribuição.

Guarú: — Este pequenino peixe, ainda menor do que a piába e de formato mais adequado para a vida em aguas razas, é encontrado em quasi todas ellas. Está incluido entre as especies ilyophagas, o que não o impede de apreciar as pequeninas larvas de mosquitos. Não é muito perseguido pelos peixes carnivoros, seja porque vive em agua muito raza, seja porque o sabor de sua carne não é apreciado.

A especie nordestina é vivapara e dahi as suas ninhadas successivas durante todo o anno. A observação popular de que este peixinho vive sempre com uma grande «barriga», reflecte-se no proprio nome regional pelo qual é conhecido: «barrigudinho». Além das ninhadas successivas, pode esta especie, com uma só fecundação, ter em andamento tres gerações. O guarú apresenta um pequeno numero de ovos, mas processando-se a evolução delles dentro dos ovarios, nascem as larvas em condições de poderem se defender dos inimigos naturaes e assim o pequeno numero de ovos é contrabalançado pelo seu alto coefficiente de aproveitamento, visto que a sua evolução é toda especial.

As facilidades de disseminação desta especie concorrem para a sua existencia em todas as aguas.

Curimatã: — Dos peixes maiores, a curimatã é o que em maior abundancia é encontrado nos açudes, pois, além de ser muito resistente ao ambiente nordestino, é a unica especie mais ou menos protegida, nesta região. Alguns proprietarios de açudes compram-na e envidam todos os esforços para a sua multiplicação, seja não permittindo a despesca senão depois de haver o peixe attingido determinado tamanho, seja procurando impedir a sua matança durante a epoca da desova. Por sua vez, a curimatã é um peixe muito prolifico. Além de possuir um grande numero de ovulos, toma certo cuidado para garantir a prole e a evolução dos mesmos. Peixes ha, como o acará, piábas, etc., que desovam nas primeiras enchentes. A curimatã não. Muitas semanas antes da epoca natural da desova, ella já se encontra com os seus orgãos genitaes em adeantado estado de evolução, porém não é qualquer enchente que lhe convem para desovar. Durante as primeiras cheias ella faz a sua subida como que sondando o ambiente, mas só vem a desovar quando pressente que a cheia perdurará por um espaço de tempo capaz de permittir a bôa evolução dos seus ovos. Em poucos dias desapparece o sacco vitelino de suas larvas e dahi por deante, adquiridos os movimentos proprios da natação, é quasi incrivel a agilidade dessas larvinhas, que tão intelligentemente costumam se esconder entre o capim alagado ou sob as folhas das plantas aquaticas. O grande numero de ovulos da curimatã e a precaução desse peixe em escolher o momento propicio para a sua desova, são factores que concorrem, de certo modo, para garantir a sua existencia. Além disso, sendo a curimatã um peixe muito migrador, aproveita, durante as cheias, a ligação dos açudes que estão sangrando e assim passa dos rios aos açudes e destes áquelles, augmentando consideravelmente

a sua area de distribuição, pois que, optimo saltador, muito poucas serão as barreiras que a possam deter.

Trahira: — Esta especie é considerada, talvez sem muita razão, como peixe dos mais damninhos, seja por causar prejuizos ao pescador, seja porque muita gentre crê ser a trahira capaz de destruir grande numero de outros peixes menores, de modo que ella, principalmente no nordeste, é bastante perseguida, ao contrario da curimatã, que como já dissemos, é a unica especie mais ou menos protegida. Quando é coberta pela tarrafa ou presa pela rêde do pescador, ás vezes corta, com seus afiados dentes, as malhas e assim põe-se a salvo. A segurança do anzol empregado na pesca da trahira deve ser reforçada, para o que os pescadores envolvem uma certa porção da linha com pequenos pedacinhos de folha de zinco, ou interpõem entre o anzol e a linha um pedaço de arame, afim de que ella não a possa cortar.

A trahira apresenta no seu regime alimentar tres phases distinctas: uma planctophaga (até 2 cms.), outra insectivora (de 10 a 15 cms.) e a ultima, que é o regime do adulto, carnivora. Pode attingir 50 cms. de comprimento; é dotada de movimentos lentos e não é peixe que persista na perseguição da presa como por exemplo o dourado. Prefere aguas não muito profundas, onde permanece muito tempo, quasi immovel, á espera de que algum peixe menos avisado passe ao alcance do seu bote. Vive bem nas aguas correntosas, porém dá preferencia ás aguas paradas. É muito resistente, podendo fazer caminhadas atravez do capim alagado em busca de outras aguas, ou quando os pequenos barreiros em que vive estão prestes a seccar, mette-se na lama e ahi permanece durante um certo tempo, a espera que novamente o barreiro tome agua. A sua resistencia, entretanto, não pode ser comparada com a do mussum, que penetra a 1 a 2 metros terra a dentro e ahi permanece mezes a fio, como tivemos occasião de observar, em alguns barreiros proximos de Fortaleza.

Os orgãos genitaes do macho não são tão desenvolvidos como os da curimatã e são representados por dois cordões longos de 2 a 3 cms. de diametro, contendo pouco esperma e apresentando aqui e acolá pequenas dilatações. A quantidade de esperma na trahira é muito inferior á da curimatã, porém os seus espermatozoides apresentam uma vitalidade cinco vezes maior do que a dos espermatozoides da curimatã.

A trahira desova parcelladamente e além disso dedica uma attenção toda especial aos seus ovos, depositando-os em uma especie de ninho, para o que aproveita as depressões naturaes das margens ou os buracos feitos pelos cascos dos animaes que entram nessas aguas para beber. A quantidade dos seus ovulos não é muito grande (10.000), mas devido ás particularidades da sua desova, é sufficiente, para assegurar uma bôa prole. Os ovos da trahira, logo após a emissão, costumam se apresentar presos uns aos outros formando um agglomerado de feitio diverso, em virtude da capsula delles conter uma substancia muito pegajosa. A evolução embora seja um pouco mais demorada do que a dos da curimatã, ainda assim é sufficientemente rapida para não permittir o apparecimento de certas molestias, porém e apenas para augmentar, admittindo-se que taes molestias possam destruir uma ninhada, ainda poderá ella reforçar o coefficiente de aproveitamento dos seus ovos, com novas desovas, durante a mesma quadra do anno.

A disseminação da trahira é quasi toda feita pelas suas larvas, que aproveitam qualquer filete de agua, pois o adulto é incapaz de vencer as quedas

dagua, preferindo algumas vezes, para contornal-as, fazer caminhadas pelas margens alagadas.

Saguirú: — Esta especie é mais exigente do que a piába e, principalmente devido ao seu regime alimentar e aos seus habitos, não é encontrada em todas as aguas nordestinas. É ilyophago, aproveitando especialmente as algas; costuma andar em cardumes e não é tão migrador como as piábas. Muito procurado pelos apreciadores de peixinhos torrados, quasi tanto quanto as piábas, é tambem muito bôa isca para os peixes carnivoros. Vive em aguas mais ou menos profundas, sendo agil e bom saltador.

A desova do saguirú é total, isto é, desova uma só vez ao anno, porém durante a quadra chuvosa, em Fortaleza, (3 a 4 mezes), sempre encontramos saguirús ovados ao lado de outros já desovados; isto significa que o saguirú desova por lotes, talvez de idades differentes. Os seus ovulos, como os da piába, são adhesivos e em quantidade bastante grande: uma femea de 150 mm. de comprimento apresentou 208.700. As suas larvas rapidamente adquirem velocidade de natação e dahi a facilidade com que se defendem dos inimigos naturaes, seja escondendo-se, seja ganhando filetes de agua onde só ellas podem permanecer.

Sómente devido ás particularidades da sua procriação é que este peixinho consegue permanecer em quantidade apreciavel em algumas bacias nordestinas, porque, além de ser pouco migrador, tem um regime alimentar muito especializado.

Acará: — Este peixe, de feitio differente daquelles de que até agora tratamos, se pelo seu formato não pudesse viver em qualquer agua, pela sua resistencia conseguiu introduzir-se em quasi todas, mesmo naquellas mais rasas onde não chega a attingir grande tamanho, O acará é peixe de movimentos lentos, um tanto quanto preguiçoso, preferindo as aguas mais ou menos rasas das margens, onde, por vezes, chega a permanecer muito tempo, quasi deitado sobre um dos flancos; nessas occasiões é facilmente apanhado pelo pescador ou pelas trahiras, das quaes é o principal alimento. O adulto não é peixe migrador, de modo que a sua disseminação só poderá ser feita pelas suas larvas quando attinguem uma agua de ligação, seguindo-a até alcançar novo ambiente.

A quantidade de ovulos que possue é pequena, porém os seus espermatozoides apresentam uma tal vitalidade, que certamente muito poucos ovulos maduros deixarão de ser fecundados, principalmente levando-se em conta que o acará costuma fazer uma pequena escavação no fundo das aguas onde os deposita.

Cangaty: — O cangaty é um peixe de couro que em nem todas as aguas do nordeste existe. É considerado como sendo o melhor peixe da região, por ter pequeno numero de espinhos e pelo sabor de sua carne, attingindo bom tamanho logo no primeiro anno. Apresenta uma biologia toda especial, porém não me deterei em considerações demoradas a respeito dessa especie, porque um trabalho extenso e detalhado sobre ella está sendo elaborado pelo Dr. Luiz Canale. É pouco migrador; pertence ao grupo dos peixes de couro e estes, como se sabe, tem habitos nocturnos e são peixes de movimentos lentos. A sua pesca é muito facil, pois o pescador sabe que durante o dia elle pouco se movimenta, estando quasi sempre mettido entre as pedras, tocas ou por baixo de touceiras de capim da margem. Um cerco de rêde bem feito, nesses logares, é sufficiente para uma bôa colheita de cangatys.

Nos peixes de couro, os machos apresentam gonadas bastante differen-

tes das dos peixes de escama: os testiculos são em regra menores, porém franjados.

O cangaty, além disto, apresenta os seus orgãos genitaes masculinos differenciados morphologica e physiologicamente em duas porções: uma anterior ou cephalica, de lobulos menores, de côr branca que segregam esperma e outra posterior ou caudal de lobulos maiores, de côr rosea, em menor numero do que os da porção anterior e que segregam uma substancia gelatinosa, que em contacto com o ar quasi se solidifica. Os canaes deferentes estão ligados a um conducto que acompanha e se amolda ao bordo anterior do 1.º raio da nadadeira anal, terminando numa especie de papilla; comprimindo-se o ventre do peixe, pode-se observar a sahida do liquido seminal e da substancia gelatinosa pela papilla. Pode-se dizer que no cangaty, ao contrario do que se passa na maioria dos nossos peixes deve haver o acto da copula, que, ao nosso ver, se processa da seguinte maneira: o macho justapõe á cloaca da femea o pseudo-penis, lançando ahi um jacto de esperma, e em seguida, com a substancia gelatinosa segregada pela porção caudal dos testiculos, tampona a abertura externa dos oviductos. Dessa forma, o liquido seminal permanece no interior dos ovarios, banhando os ovulos que, entretanto, só vêm a ser fecundados mais tarde, por occasião da sua expulsão, isto é, quando estiverem perfeitamente madudos. Os espermatozoides do cangaty, além de terem grande vitalidade, são bastante maiores do que os dos outros peixes, com os quaes já trabalhamos e morrem quando em contacto com a agua.

A phase planctophaga do cangaty é apenas de 8 dias, passando logo as larvas para o regime insectivoro e mais tarde para o omnivoro. Durante essa phase larval, este peixe esconde-se entre os detrictos e gravetos com extrema habilidade e de tal forma que só uma vista habituada o descobre. Em quatro mezes elle alcança 161 mm. de comprimento, não constituindo mais presa facil para os peixes carnivoros, em vista dos seus fortes esporões, que guarnecem as nadadeiras peitoraes e dorsal.

Piáu: — Quanto ao piáu, peixe tambem de valor commercial, podemos dizer, que a sua biologia, se approxima da biologia da curimatã, porém o seu regime alimentar é inteiramente differente, pois o piáu é quasi essencialmente herbivoro e essa particularidade do seu regimen concorre para que elle não consiga estender consideravelmente a sua area de distribuição.

Cascudo: — O cascudo, que, como o cangaty, tambem faz parte dos *Nematognathas*, é um peixe que existe na maioria das nossas aguas, mas raramente é encontrado em grande abundancia. Sendo mais commum nos logares pedregosos, proximo ás cachoeiras dos grandes rios, admira-nos como elle tão bem se adaptasse ás aguas represadas do nordeste.

A sua resistencia é muito grande, podendo viver muitas horas fóra d'agua. Pode e parece que costuma fazer caminhadas por terra firme, em busca de novos ambientes. A sua pesca, comquanto seja facil por preferir esta especie as locas de pedras, não é muito rendosa, pois o mercado quasi não lhe dá valor, talvez mais devido ao seu feitio do que ao sabor de sua carne, que pode ser considerada bôa.

Como excepção entre os *Nematognathas*, o cascudo apresenta os testiculos reduzidos a fitas, isto é, com aspecto taeniforme e contendo pouca quantidade de liquido seminal, porém os seus espermatozoides apresentam uma vitalidade digna de nota. Tivemos occasião de acompanhar a movimentação dos esper-

matozoides de cascudo pelo espaço de 70 minutos. Deve-se fazer o estudo da vitalidade dos espermatozoides das especies de cascudos que vivem nas aguas correntosas, pois Scheuring affirma possuirem os peixes que desovam em aguas paradas, espermatozoides de vitalidade maior do que os daquelles que costumam desovar em aguas correntosas.

O numero de ovulos do cascudo não é muito grande (4.000); momentos após terem sido eliminados, prendem-se uns aos outros, de tal forma que só difficilmente os poderemos separar, pois ha entre elles como que uma soldadura, capsula com capsula. Não nos foi possivel observar, em natureza, a desova do cascudo, mas pelo que nos informaram e pelo que pudemos observar nas desovas em aquarios, somos levados a admittir que a especie nordestina desova em lócas ou logares abrigados.

Ora, sendo o numero de ovulos do cascudo relativamente pequeno, possuindo o espermatozoide da especie em questão tão grande vitalidade e admittindo-se que elle desove em ninhos, é claro, que o aproveitamento da sua desova deve ser quasi total. Ainda mais, a evolução dos seus ovos, ao contrario do que se passa na maioria dos peixes nacionaes, faz-se lentamente: 7 dias contra 1 a 1 1/2 e bôa parte das transformações que as larvas da maioria dos peixes costumam fazer fóra do ovo, as do cascudo fazem ainda protegidas pela capsula. Ao nascer, a larva está com suas nadadeiras formadas, com o typo da dentição do adulto, emfim com todos os seus orgãos perfeitamente constituidos, isto é, em condições proprias para seguir desde já o regime e os habitos de vida do adulto. Ao sentir-se perseguida, a larva do cascudo mette-se entre as pedras ou no lôdo, de tal forma que difficilmente a poderemos apanhar.

Do que acabamos de dizer, conclue-se que na biologia desta especie não é facil encontrarmos razões que possam explicar a sua existencia sempre em pequena quantidade. Parece-nos mais acertado admittirmos a hypothese de que esta especie seja uma das que se encontram em via de desapparecimento e dahi a razão desse peixe, sentindo que tende a desapparecer, lançar mão de todas as suas energias, transformando-as em forças de protecção capazes de assegurar a vida da especie ainda por algum tempo. A questão torna-se sobremodo interessante, porque, como vimos, duas series de forças antagonicas actuam sobre a especie: uma procurando exterminal-a, outra defendendo-a, para que não desappareça. Por quanto tempo ainda perdurará essa lucta?

Do Quadro da pag. 58 ressalta o seguinte:

A) — As especies que têm alimentação variada, cuja desova é feita parcelladamente e que têm tendencia migradora bastante accentuada, encontram-se sempre em quantidade apreciavel em quasi todas as aguas da região.

Nesse quadro, a trahira está collocada entre as especies existentes em quasi todas as aguas, não obstante ser peixe de alimentação restricta e de habitos sedentarios. Esta apparente discordancia da regra geral pode ser facilmente explicada. As autopsias de trahiras revelam que o seu regime carnivoro lhe traz algumas vantagens, pois não tem necessidade de estar sempre com o estomago cheio, bem alimentada um dia, poderá passar outro ou diversos sem alimento. No trabalho sobre esta especie, que está sendo elaborado pelo Dr. R. von Ihering, será apresentada uma tabella, mostrando que de 141 exemplares apanhados em natureza, 79 estavam com estomago vasio. O regime alimentar da trahira adulta

Especies	Alimentação		Orgãos genitaes		Desova			Abundancia e frequencia			
	Variada	Restricta	Gonadas contendo grande numero de ovulos e esperma com pequena vitalidade	Gonadas contendo pequeno numero de ovulos e esperma com grande vitalidade	Parcial	Total	Incubação especial dos ovos	Dissemi-nação facil	Existencia em quasi todas as aguas	Existencia só em deter-minadas aguas	Gregarios
Piaba	Sim	—	Sim	—	Sim	—	—	Sim	Sim	—	Sim
Guarú	Sim	—	—	Sim	Sim	—	Sim	Sim	Sim	—	Sim
Curimatã	— *	Sim	Sim	—	—	Sim	—	Sim	Sim	—	Sim
Trahira	— *	Sim	—	Sim	Sim	—	Sim	— *	Sim	—	—
Saguirú	— *	Sim	Sim	—	—	Sim	—	—	—	Sim	Sim
Acará	Sim	—	—	Sim	Sim	—	Sim	— *	Sim	—	— *
Cangaty	Sim	—	—	Sim	—	Sim	Sim	—	—	Sim	—
Piáu	— *	Sim	Sim	—	—	Sim	—	Sim	—	Sim	Sim
Cascudo	—	Sim	—	Sim	—	Sim	Sim	—	—	Sim	—

* Na phase de alevino = Sim

permitte que ella viva em quasi todas as aguas do paiz, mas concorre para restringir um pouco a sua densidade, o que aliás se verifica com relação a todos os animaes carnivoros. Quanto ao sedentarismo da trahira adulta, este é contrabalançado pelas facilidades de disseminação com que a natureza dotou as suas larvas e alevinos, os quaes podem viver em qualquer agua, devido ao seu regime planctophago e depois insectivoro.

Tambem a curimatã, no quadro acima, apparece como excepção á regra ennunciada, pois apresenta regime alimentar restricto, não desova parcelladamente e é encontrada em quasi todas as aguas da região. Mas como acima, tambem aqui poderemos explicar esta apparente excepção, se levarmos em conta que a curimatã é um dos peixes mais migradores que conhecemos: se não bastasse essa migração tão propria da especie, o homem ainda auxilia efficientemente a sua disseminação, levando-a para quasi todos os ambientes que, pelos seus proprios recursos, não poderia attingir. Desta forma, a curimatã deveria ser encontrada não sómente em quasi todas as aguas e sim em todas; porém isso não foi o que constatamos, visto não poder ella fugir á escravidão do seu regime alimentar. Poderá ir ou ser levada para qualquer ambiente, mas só conseguirá proliferar naquelles, em que encontrar condições propicias á sua vida.

Haja vista o que foi observado por nós nas aguas represadas da serra de Guaramiranga (Ceará). Muitos proprietarios de açudes dessa região ahi tem introduzido a curimatã, mas não tem conseguido a sua creação. Examinando o lôdo do fundo desses açudes, constatamos a inexistencia absoluta de algas do grupo das diatomaceas, alimento especial da curimatã. E, assim, mais uma vez se confirma a asserção de que o homem poderá intervir, visando melhorar a natureza das cousas, mas só até um determinado limite.

Quanto ao cangaty, peixe de alimentação variada, de evolução toda especial e que é encontrado apenas em determinadas aguas, isso talvez possa ser explicado pelo absoluto sedentarismo do adulto e de suas larvas.

B) — Ao contrario das especies de que tratamos acima, os peixes de alimentação restricta e que não apresentam uma facil disseminação (talvez como consequencia do seu regime alimentar), só existem em determinadas aguas e quasi sempre em quantidade não muito consideravel, não obstante serem estas especies, ou muito prolificas, como por exemplo o piáu, ou muito protegidas pela natureza, que lhes concedeu recursos especiaes, garantindo o mais possivel a sua prole.

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A pequena região aqui estudada é typica para a faixa littoranea, das bacias dos rios Cocó, Choró e Pacoty, fóra do alcance da agua salôbra. Mais terra a dentro, no sertão propriamente dito, o aspecto se modifica, desde que se penetre nas bacias do Jaguaribe ou do Piranhas. Nestas a fauna é mais variada, accrescendo generos e familias que não conseguem se manter nos pequenos rios. Neste sentido, cumpre salientar as piranhas *(Serrasalmonideos)*, a jutubarana *(Salminus)* e os Nemathognathas maiores, isto é, uma serie de carnivoros que só podem viver em ambientes em que haja agua e maior variedade de alimento adequado á volta do anno todo.

É evidente que especies ubiquitarias, como as de que tratamos nas paginas precedentes, possam habitar aguas tão adversas como as das redondezas de Fortaleza. Das especies carnivoras só subsistiram os *Erythrinineos*, porque, sendo necessario, a trahira e o jejú, mesmo em adulto, continuam a se alimentar de insectos, camarões e mesmo de aroás (*Ampullaria*), como fazem quando pequenos na phase de «sovelas» (10 a 15 cms. de comprimento).

Dos herbivoros e frugivoros, os mais exigentes, como a piracanjuba (*Brycon*) e o pacú (*Myletes*) desappareceram completamente; os *Leporinus*, de regime alimentar um pouco menos especializado, conseguiram permanecer em algumas bacias, porém a sua pequena frequencia nos rios costeiros é determinada pela lucta constante entre a especie e o meio ambiente. Ao contrario, nos grandes reservatorios de agua situados nas zonas de Icó (Ceará) e Caicó (R. G. do Norte), é conhecida a abundancia dos *Leporinus*. É este um lindo exemplo em que o homem apparece como factor de ressurgimento de uma especie fadada a desapparecer, victima dos seus reduzidos meios de adaptação á inclemencia nordestina.

A ichthyofauna do Nordeste hoje é pobre e se as mesmas especies que encontramos na Amazonia tambem estão no rio S. Francisco, é evidente que outrora habitaram tambem a zona intermediaria, isto é, o Nordeste. Focalizemos neste sentido, como exemplo typico, o mandy (*Pimelodus clarias*). Sem duvida foi elle escorraçado desse ambiente, em tempo não muito remoto.

Agora, porém, com as modificações introduzidas pelo homem, com a construcção de açudes de agua perenne, poderá elle voltar a occupar o mesmo ambiente, tal qual está acontecendo com o piáu, e bem assim tantos outros peixes que estejam em condições identicas.

É esta a tarefa que a Commissão Technica de Piscicultura se propõe a realizar, debaixo de um criterio não só ecologico mas tambem economicamente o mais adequado ao homem.

Sur la question d'helminthofaune du chameau en Turkmenie

N. V. Badanine

Professeur de la Chaire de Parasitologie de l'Institut Agricole Turcoman

[Avec 1 planche]

Comme base fondamentale pour l'étude d'helminthofaune du chameau turcoman on s'est servi du matériel de 25 autopsies complètes effectuées d'après la méthode de l'académicien K. J. Scriabine, durant la période de 1921 jusqu'à nos jours.

La base primordiale de ces études a été fondée par les expéditions helminthologiques de USSR suivantes:

Par la 5-me expédition helminthologique de l'USSR, qui a travaillé en 1921 sous la direction de l'acad. K. J. Scriabine dans la région occupée actuellement par les republiques de l'Asie Centrale; il a été autopsié dans la ville de Tschardjow quatre chameaux, dont — 3 *Camelus dromedarius* et — 1 *Camelus bactrianus*.

Par la 36-me expédition helminthologique de l'USSR, qui a travaillé également sous la direction de l'acad. K. J. Scriabine en automne de l'an 1926, dans l'Asie Centrale Soviétique; il a été autopsié par cette expédition 3 chameaux — tous de l'espèce *Camelus bactrianus*, dont 2 étaient autopsiés à Ashkhabad et 1 à Tschardjow.

Plus tard, les études sur l'helminthofaune étaient poursuivies par la Station Scientifique Expérimentelle Vétérinaire (Ashkhabad). La Section helminthologique de la Station a effectué 4 autopsies, dont deux en 1933 dans la région de Merv et les deux autres en 1936 dans la région d'Ashkhabad. Tous les 4 chameaux étaient de l'espèce *Camelus dromedarius*.

Et enfin, durant la période 1933-1937 il a été effectué par la chaire de parasitologie de l'Institut Agricole Turcoman 13 autopsies helminthologiques complètes de chameau agés de 2.5 à 19 ans, de sexe différent et dans les régions différentes de la Turkménie. Tous ces chameaux autopsiés à l'exception d'une femelle (N. 51) appartenaient à l'espèce — *Camelus dromedarius*.

Pour ce qui concerne l'étude du matériel accumulé, il se présente sous un aspect suivant:

Le matériel recueilli par la 1 à 5-me expédition helminthologique de l'USSR. a été étudié en partie par le prof. V. P. Baskakov et publié en 1924 (1). Dans ce travail le prof. Baskakov a enrégistré 8 espèces suivantes d'helminthes parasites du chameau turcoman:

1. *Echinococcus granulosus* (Batsch, 1786).
2. *Stilesia vittata* Railliet, 1896.
3. *Trichostrongylus probolurus* (Railliet, 1896).

4. *Trichostrongylus vitrinus* Looss, 1905.
5. *Camelostrongylus mentulatus* (Railliet & Henry, 1909).
6. *Trichocephalus skrjabini* (Baskakov, 1924).
7. *Physocephalus sexalatus* (Molin, 1860).
8. *Parabronema skrjabini* Rasowska, 1924.

Le matériel sur les chameaux, autopsiés para la 36-me expédition helminthologique de l'USSR. a été étudié par Z. Rajevskaja et publié en 1933 par Z. Rajevskaja et N. Badanine dans un travail colléctif en forme de monographie, consacré aux invasions helminthiasiques du chameau (2).

L'on peut voir d'après ce travail, que la liste des helminthes du chameau s'est augmentée de 3 espèces:

1. *Fasciola hepatica* L., 1758.
2. *Nematodirus mauritanicus* (Maupas & Seurat, 1912).
3. *Dictyocaulus hadweni* Chapin, 1925.

En dehors de ces traveaux N. V. Badanine et A. J. Pervakov ont publié dans le journal «La vétérinairie Soviètique» une notice, dans laquelle ils mentionnent, comme ver parasitique du chameau turcomau — le filaire *Dipetalonema evansi* Lewis, 1882 (3).

Le matériel littéraire sur l'Helminthofaune du chameau turcomau est épuisé par ces données.

Outre le matériel déjà publié, nous avons reussi à profiter de deux manuscripts inédits. Le prémier manuscript est un travail de diplôme de N. N. Déev, étudiant de l'Institut Agricole Turcomau (4). Dans ce travail executé sous notre direction auprès de la chaire de parasitologie, N. Déev a soumis aux recherches l'helminthofaune d'une femelle, agée de quinze ans, de l'espèce *Camelus dromedarius*. Il constate ainsi la présence de cinq espèces d'helminthes suivantes:

1. *Echinococcus granulosus* (Batsch, 1786).
2. *Stilesia vittata* Railliet, 1896.
3. *Trichostrongylus probolurus* (Railliet, 1896).
4. *Physocephalus sexalatus* (Molin, 1860).
5. *Dipetalonema evansi* Lewis, 1882.

Le second manuscript appartient à la gérante de la Section d'helminthologie de la Station Vétérinaire à Ashkhabad, Chr. Tschernikova et nous présente les résultats des études sur le matériel de quatre autopsies helminthologiques complètes du chameau, effectuées par cette Station (5).

Selon ce dernier travail l'helminthofaune du chameau turcoman s'enrichit de neuf espèces de vers parasitiques suivants:

1. *Trichocephalus ovis* Abildgaard, 1795.
2. *Chabertia ovina* Fabricius, 1788.
3. *Oesophagostomum venulosum* Rudolphi, 1819.
4. *Trichostrongylus colubriformis* (Giles, 1892).
5. *Trichostrongylus axei* (Cobbold, 1879).

6. *Ostertagia marshalli* (Ransom, 1907).
7. *Ostertagia occidentalis* (Ransom, 1907).
8. *Haemonchus contortus* (Rudolphi, 1803).
9. *Dictyocaulus filaria* Rudolphi, 1809.

Ainsi, d'après les données littéraires et les manuscripts, nous voyons, que le chameau turcoman ce présente, comme hôte de 21 espèces de vers parasitiques.

RECHERCHES PERSONELLES

Il a été effectué par nous auprès de la chaire de parasitologie de l'Institut Agricole Turcoman, 12 autopsies complètes de chameaux dans diverses régions du pays. L'âge des animaux variait dans les plus larges limites, de 2,5-19 ans. Onze d'entre eux appartenaient à l'espèce — *Camelus dromedarius*, dont dix mâles et une femelle. Le douzième chameau autopsié était un hybride-femelle. Dans dix cas ils avaient été abattus spécialement pour les autopsies. Dans deux cas on a profité des cadavres des chameaux péris.

Les autopsies ont été effectuées d'après la méthode de l'acad. Scriabine qui a été décrite par lui en détail. dans sa brochure (6). C'est pourquoi nous ne nous attarderons pas pour faire un exposé de la technique de l'autopsie.

Hors les autopsies helminthologiques complètes, executées dans le but d'élucider l'étiologie des helminthoses du chameau, nous avons utilisé les autopsies helminthologiques des organes isolées, comme l'oesophage, les pancréas, l'abomasum etc. Outre cela, nous avons utilisé pour le même but le matériel helminthofaunistique obtenu en résultat des autopsies pathologiques anatomiques ordinaires, effectuées sur des cadavres des chameaux péris.

Grâce à toutes ces conditions. nous avons eu la possibilité d'élargir considérablement la liste des helminthes du chameau turcoman. Outre les 22 espèces sus-mentionnées nous avons trouvé les formes suivantes:

1. *Dicrocoelium lanceatum* Stil. & Hass., 1895.
2. *Moniezia expansa* (Rudolphi, 1810).
3. *Ostertagia ostertagi* (Stiles, 1892).
4. *Cooperia bisonis* Cram, 1925.
5. *Cooperia oncophora* (Railliet, 1898).
6. *Cooperia zurnabada* Antipin, 1931.
7. *Nematodirus helvetianus* May, 1920.
8. *Thelazia leesei* Railliet & Henry, 1910.
9. *Onchocerca fasciata* Railliet & Henry, 1910.
10. *Ostertagia circumcincta* (Stadelmann, 1894).
11. *Oesophagostomum columbianum* (Curtice, 1890).

Nous voyons ainsi, que les 32 espèces des helminthes, revelées pour le moment chez le chameau turcoman, peuvent être classées successivement en deux types, trois classes, six ordres, douze familles et vingt genres.

Nous devons noter ensuite, que le chameau turcoman nous apparaît comme un nouvel hôte de deux espèces de vers parasitiques, voir:

Type *Platodes* Leuckart, 1854.

Classe *Trematoda* Rudolphi, 1808.

Sous-classe *Digenea* Carus, 1863.

Ordre *Fasciolata* Skrjabin & Schulz, 1936.

Famille *Fasciolidae* Railliet, 1895.

Sous-famille *Fasciolinae* Stiles & Hassall, 1898.

Genre *Fasciola* L., 1758.

1. *Fasciola hepatica* L., 1758.

Famille *Dicrocoeliidae* Looss, 1907.

Genre *Dicrocoelium* Dujardin, 1845.

2. *Dicrocoelium lanceatum* Stiles & Hassall, 1896.

Classe *Cestoidea.*

Ordre *Cyclophyllidea.*

Sous-ordre *Anoplocephalata* Skrjabin, 1933.

Famille *Anoplocephalidae* (Cholodk., 1902).

Sous-famille *Anoplocephalinae* Fuhrmann, 1907.

Genre *Moniezia* Blanchard, 1891.

3. *Moniezia expansa* (Rudolphi, 1810).

Famille *Thysanosomatidae* Skrjabin & Schulz, 1937.

Sous-famille *Avitellininae* Gough, 1911.

Genre *Stilesia* Railliet, 1893.

4. *Stilesia vittata* Railliet, 1896.

Sous-ordre *Taeniata* Skrjabin & Schulz, 1937.

Famille *Taeniidae* Ludwig, 1886.

Genre *Echinococcus* Rudolphi, 1801.

5. *Echinococcus granulosus* (Batsch, 1786).

Type *Nemathelminthes.*

Classe *Nematoda* Rudolphi, 1808.

Ordre *Strongylata* Railliet & Henry, 1913.

Sus-famille *Trichostrongyloidea* Cram, 1927.

Famille *Trichostrongylidae* Leiper, 1912.

Sous-famille *Trichostrongylinae* Leiper, 1908.

Tribe *Trichostrongylea* Skrjabin & Schulz, 1937.

Genre *Trichostrongylus* Looss, 1905.

6. *Trichostrongylus axei* (Cobbold, 1879).
7. *Trichostrongylus colubriformis* (Giles, 1892).
8. *Trichostrongylus probolurus* (Railliet, 1896).
9. *Trichostrongylus vitrinus* Looss, 1905.

Tribe *Cooperiea* Skrjabin & Schulz, 1937.

Genre *Cooperia* Ransom, 1907.

10. *Cooperia bisonis* Cram, 1925.
11. *Cooperia oncophora* (Railliet, 1898).
12. *Cooperia zurnabada* Antipin, 1931.

Tribe *Ostertagiea* Skrjabin & Schulz, 1937.

Genre *Ostertagia* Ransom, 1907.

Sous-genre *Ostertagia (Ostertagia)* Orloff, 1933.

13. *Ostertagia circumcincta* (Stadelmann, 1894).
14. *Ostertagia ostertagi* (Stiles, 1892).

Sous-genre *Ostertagia (Marshallagia)* Orloff, 1933.

15. *Ostertagia marshalli* Ransom, 1907.

Sous-genre *Ostertagia (Grossospiculagia)* Orloff, 1933.

16. *Ostertagia occidentalis* Ransom, 1907.

Genre *Camelostrongylus* Orloff, 1933.

17. *Camelostrongylus mentulatus* (Railliet & Henry, 1909).

Sous-famille *Nematodirinae* Neveu-Lemaire, 1934.

Tribe *Nematodirea* Skrjabin & Schulz, 1937.

Genre *Nematodirus* Ransom, 1907.

18. *Nematodirus helvetianus* May, 1920.
19. *Nematodirus mauritanicus* Maupas & Seurat, 1912.

Tribe *Haemonchea* Skrjabin & Schulz, 1937

Genre *Haemonchus* Cobbold, 1898.

20. *Haemonchus contortus* (Rudolphi, 1803).

Sus-famille *Strongyloidea* Weinland, 1853.

Famille *Strongylidae* Baird, 1853.

Sous-famille *Oesophagostomatinae* Railliet, 1915.

Genre *Oesophagostomum* Molin, 1861.

21. *Oesophagostomum columbianum* (Curtice, 1890)

22. *Oesophagostomum venulosum* (Rudolphi, 1809).

Genre *Chabertia* Railliet & Henry, 1909.

23. *Chabertia ovina* (Fabricius, 1788).

Sus-famille *Metastrongyloidea* Cram, 1927.

Famille *Metastrongylidae* Leiper, 1908.

Sous-famille *Dictyocaulinae* Skrjabin, 1933.

Genre *Dictyocaulus* Railliet & Henry, 1907

24. *Dictyocaulus filaria* (Rudolphi, 1809).
25. *Dictyocaulus hadweni* Chapin, 1925.

Ordre *Filariata* Skrjabin, 1915.

Famille *Filariidae* Cobbold, 1864.

Sous-famille *Setariinae* Yorke & Maplestone, 1926.

Genre *Dipetalonema* Diesing, 1861.

26. *Dipetalonema evansi* (Lewis, 1882).

Sous-famille *Onchocercinae* Leiper, 1911.

Genre *Onchocerca* Diesing, 1841.

27. *Onchocerca fasciata* Railliet & Henry, 1910.

Sous-ordre *Spirurata* Railliet & Henry, 1915.

Famille *Spiruridae* Oerley, 1885.

Sous-famille *Ascaropinae* Alicata & McIntosh, 1933.

Genre *Physocephalus* Diesing, 1861.

28. *Physocephalus sexalatus* (Molin, 1860).

Sous-famille *Habronematinae* Chitwood & Wehr, 1932.

Genre *Parabronema* Baylis, 1921.

29. *Parabronema skrjabini* Rassowska, 1924.

Famille *Thelaziidae* Skrjabin, 1915.

Sous-famille *Thelaziinae* Baylis & Daubney, 1926.

Genre *Thelazia* Bosc., 1819.

30. *Thelazia leesei* Railliet & Henry, 1910.

Ordre *Trichocephalata* Skrjabin & Schulz, 1928.

Famille *Trichocephalidae* Baird, 1853.

Genre *Trichocephalus* Schrank, 1788.

31. *Trichocephalus ovis* (Abildgaard, 1795).
32. *Trichocephalus skrjabini* (Baskakow, 1924).

Nous voyons ainsi, que les 32 espèces des helminthes revelés pour le moment chez les chameaux turcomans peuvent être classés successivement en deux types, trois classes, six ordres, douze familles et vingt genres.

Il faudra noter ensuite, que le chameau turcoman nous apparait, comme un novel hôte de deux espèces de vers parasitiques, voir

Oesophagostomum columbianum
Cooperia zurnabada.

Et enfin, dans ce travail nous enregistrons pour la première fois sur le territoire de l'USSR deux formes spécifiques pour le chameau, qui ont été trouvé jusqu'à présent seulement hors des limites de l'USSR. Ce sont:

1. *Onchocerca fasciata*, et
2. *Thelazia leesei.*

Pour conclure, nous jugeons indispensable de donner une description des deux formes de vers parasitiques du chameau turcoman,

1. *Onchocerca fasciata*
2. *Thelazia leesei.*

La déscription de ces deux formes avec quelques figures originales est d'autant plus indispensable que nous avons considérablement élargi dans notre travail l'aréal de l'expansion de ces deux espèces. Jusqu'à présent elles se manifestaient très rarement et par conséquent leur déscription a été incomplète. Il est vrai, que notre matérial n'est pas bien riche en quantité et n'est pas de grande valeur grâce à l'absence des mâles. Toutefois nous présentons dans notre déscription quelques nouveaux détails et par cela même nous consolidons l'existence de ces deux espèces bien rares.

Thelazia leesei Railliet & Henry, 1910.

C'est une espèce d'extrême rareté, dont les cas de manifestation peuvent être comptés comme cas exceptionnels. Dans un de leurs travaux de 1910, Railliet & Henry (7) nous informent, que Goubeaux avait trouvé en 1853 à Alfort un filaire dans la glande gauche lacrimale d'un dromadaire. Il est fort possible, que c'est Goubeaux le premier, qui a entrevu la *Thelazia leesei.*

Dans ce même travail Railliet & Henry, se basant sur l'étude d'une femelle, qui leur a été envoyée de Lahor (Punjab) par A. S. Leese, officier vétérinaire, ont décrit l'espèce nouvelle, qui a reçu en l'honneur de leur correspondant le nom de *Thelazia leesei.*

Quelques mois après nous voyons paraître un nouveau travail des mêmes auteurs (8) dans lequel ils présentent une déscription complementaire de l'espèce, argumentée par eux sur la base de l'étude du mâle et de la femelle, reçues du susdit A. S. Leese. Il c'est trouvé, que son assistant Ata Mohamed à l'autopsie du dromadaire a découvert à la face interne du corps clignotant un kyste de la grosseur d'un pois. A l'autopsie de cette tumeur il s'y trouva 8 vers adultes, dont trois mâles e 5 femelles. Après avoir étudié la femelle

et le mâle, qui leur étaient transmis. Railliet & Henry constatèrent, que ces vers se rapportaient à l'espèce *Thelazia leesei*.

Finalement, comme dernière manifestation de *Thelazia leesei*, nous pouvons citer notre cas. Notons, que vous avons mis beaucoup de temps pour découvrir cette forme, très rare dans limites de USSR. Durant la période 1928-1937 nous avons soumis à l'inspection plus de dix milles chameaux dans les limites de l'Asie Centrale Soviétique et n'avons pas trouvé de *Thelazia*. Le seul exemplaire d'une femelle *Thelazia leesei* a été trouvé à l'autopsie pathologique anatomique d'un chameau péri. Cette autopsie a été effectuée à Askhabad (Turkménie) en 1933.

Avant de passer à la déscription de l'espèce, nous devons signaler, que pour le mâle nous avons utilisé les données de Railliet & Henry dans leur travail déjà cité par nous (8); la femelle a été décrite d'après notre exemplaire sans aussi négliger les données de Railliet & Henry (7 et 8).

Description de l'espèce.

Le mâle: — Long de 12 mm., épais de 0,21 mm. vers le milieu du corps L'extrémité postérieure recourbée en crochet sur la face ventrale. Capsule buccale petite, à la lumière se retrecissant progréssivement du fond vers l'ouverture buccale. L'oesophage — 0,29 mm. de long. Longueur des spicules respectivement de 0,31 et 105 mm.; le grand assez grêle, le court plus épais, à terminaison arrondie. L'extrêmité postérieur ne porte pas moins de 25 papilles préanales; (Railliet & Henry n'ont pas reussi à établir le nombre des papilles postanales). Le tube génital se forme, comme à la règle, dans la partie antérieure; il commence de l'extrémité antérieure à une distance de 0,86 mm.

Femelle: — L'exemplaire, qui a été à notre disposition avait 11,1 mm. de longueur avec une épaisseur de 0,18 mm. au niveau du bout de l'oesophage, 0,216 mm. dans le domaine de la vulve et 0,0675 mm. au niveau de l'anus. La capsule buccale large de 0,025 mm. à sa base et 0,0125 mm. de profondeur, ayant la forme d'un vase avec une épaisseur maximale à sa mi-hauteur. L'ouverture buccale est entourée de six papilles, dont deux plus massives, latérales et quatre plus petites, sousmédianes. Elles sont toutes de forme sémisphérique. L'oesophage presque cylindrique mésure 0,36 mm. Le collier nerveux ceintre l'oesophage à 0,198 mm. de l'extrémité antérieure. La vulve s'ouvre ventralement par un trou oval, à peine visible, à 0,63 mm. de l'extrémité antérieure. L'extrémité postérieure au bout obtus, un tout petit peu retrecie dorsalement est munie d'une paire de papilles de forme conique. L'ouverture anale se trouve disposée à 0,07 mm. de l'extrémité postérieure. Toute la cuticule de la femelle est striée transversalement; au milieu du corps les stries sont distancées à peu près de 0,001 mm. Dans la cavité de la matrice de femelle nous avons trouvé des oeufs de forme ovale, 0,035 mm. de long et 0,0175-0,02 mm. de large. Railliet & Henry indiquent, que les femelles qu'ils avaient à leurs disposition étaient 15 à 21 mm. de long, 0,1 mm. d'épaisseur maximale. Oesophage 0,32-0,335 mm. de long, 0,06 d'épaisseur. Le collier nerveux se trouvait à une distance de 0,23-0,28 mm. de l'extrémité antérieure; la vulve s'ouvrait à 0,125-0,41 mm..

BIOLOGIE: — Inconnue.
HOTE DÉFINITIF: — *Camelus dromedarius.*
DISTRIBUTION: — Asie, Punjab (Inde angl.) et Ashkhabad (Turkménie)

Onchocerca fasciata Railliet & Henry, 1910.

C'est aussi une forme bien rare, propre seulement au dromadaire. A. Henry & G. Masson dans leur travail, consacré à l'onchocercosis des chameaux (9) ont amassé toute la littérature sur ce sujet. Selon ces auteurs l'onchocerca des chameaux a été pour la prémière fois mentionné en 1909 par Y. B. Cleland. Ce dernier a découvert les fragments des filaires dans les nodules nombreux, localisés dans le tissu conjonctif sous-cutané du cou et sous la queue des chameaux importés de l'Inde anglaise en Australie:

Il a été impossible de déterminer ces filaires à cause des difficultés, que présentaient leur extirpation du tissu fibreux.

A. S. Leese, officier vétérinaire, chargé spécialement de l'étude des maladies du chameau dans l'Inde anglaise, s'interessa à la question, soulevée par Y. B. Cleland. Peu de temps après, il trouva dans les tumeurs du tissu conjonctif sous-cutané du chameau de Punjab des fragments de certains filaires. Il avait transmis ces fragments à Paris, pour les études de A. Henry & Railliet. Il en résulta un travail de A. Railliet & A. Henry (10) qui parût en 1910, dans lequel les auteurs on crée, sur la base du matériel transmis par A. S. Leese, une nouvelle espèce — *Onchocerca fasciata.*

Dans la même année 1910, Y. B. Cleland et T. H. Johnston ont signalé une découverte reiterée de l'onchocercosis chez deux chameaux, importés de l'Inde en Australie. Entre autre, dans ce même travail, les auteurs attirent l'attention sur l'absence de la différence dans les fragments de l'onchocerca chez les chameaux et les bovidés.

N'ayant pu trouver de fragments de mâles, ils n'osèrent soulever la question de l'identification des agents de l'onchocercosis des chameaux et celui des bovidés.

Ensuite, comme le démontrent A. Henry & G. Masson dans leur travail (9) il y a une indication de F. E. Masson sur la présence des nodules d'onchocerca chez les chameaux de l'Egypte (1912) Ferraro mentionne l'onchocercosis des chameaux dans l'Eritrée (1913) et finalement A. S. Leese maintes fois cité par nous, a décrit en 1917 l'onchocercosis des chameaux dans le Soudan de l'Egypte (11).

Pour achever la liste des travaux sur l'onchocercosis des chameaux nous voudrions fixer l'attention sur le travail de A. Henry & G. Masson (9), maintes fois cité par nous. Dans ce travail, les auteurs confirment, qu'ils ont réussi à extirper une quantité considérable de fragments de vers se trouvant dans les nodules du tissu conjonctif sous-cutané, dans la région du cou. Parmi ces fragments les auteurs ont découvert une extrémité antérieure et plusieurs extrémités postérieure d'une femelle et une extrémité postérieure d'un mâle. Se basant sur l'étude de ces fragments, les auteurs ont considérablement élargi la déscription, qui a été donnée sous forme assez restreinte, par les créateurs de l'espèce et démontrent l'existence indépendante de l'*Onchocerca fasciata.*

Pour ce qui concerne notre propre matériel, voici ce que nous pouvons dire. Il a été effectué en Turkménie 25 autopsies helminthologiques complè-

tes, selon la méthode de l'acad. K. J. Scriabine; en outre nous avons pris part à toute une série d'autopsies pathologiques anatomiques de cadavres. Comme résultat de nos recherches nous pouvons constater, que l'onchocerca a été trouvé seulement en deux cas. Dans les deux cas, les onchocerca se trouvaient localisés dans quelques tumeurs latérales, dures à tâter, de la grandeur d'une noix, dans le *ligamentum nuchae*.

Dans le premier cas les tumeurs étaient disposées sur la crête du cou et entre deux feuilles de la partie lamineuse du *ligamentum nuchae* de chaque côté. Dans le second cas — sur la crête du cou et du côté du dehors de la partie lamineuse.

Dans les deux cas nous avons réussi de decéler les fragments des femelles seulement.

Pour la déscription de l'espèce des mâles nous nous sommes servi du travail de A. Henry & G. Masson (9) et pour les femelles du même travail en y adjoignant celui de A. Railliet & Henry (10) plus nos compléments.

Description de l'espèce.

Le corps du parasite est couvert d'épaississement annulaires, transversals de la cuticule situés en spirale. Ces épaississements ont des courbes légèrement onduleuses. Ils sont croisés par quatre épaississements longitudinals, ondulents aussi. A la place du croisement, les branches des épaississements transversals semblent diverger l'une par avant, l'autre par derrière, ce qui forme un dessin bien original de ces incrustations cuticulaires, comme l'on peut voir sur notre dessin.

Le mâle: — Longueur inconnue, ainsi que la texture de l'extrémité antérieure. La cloaque disposée à 0,098 mm. de l'extrémité postérieure. Le spicule grêle est 0,315 mm. de long, l'autre, plus gros — 0,095 mm. de long. A. Henry & G Masson qui ont étudié le mâle n'ont pas réussi à nous donner la description de la disposition des papilles caudales. Ils affirment, entr'autre dans leur travail (9), que le caractère, qui doit être surtout retenu pour l'espèce — c'est la longueur des spicules: le grand spicule est environ trois fois et demie la longueur du petit.

Femelle: — Longueur inconnue, épaisseur maximale — 0,1 à 0,175 mm. L'extrémité antérieure sans gonflement visible. L'oesophage — 1,6 mm. de long. La disposition de la vulve n'est pas établie. Le bout caudal se termine souvent par un petit bouton susceptible de se dissimuler dans une capsule. Les oeufs, que nous avons découvert dans la matrice de la femelle, munis d'une enveloppe d'un contour, excessivement délicate, avaient tantôt une forme presque régulièrement sphérique, tantôt légèrement ovale. Leur diamètre variait entre 0,03-0,038 mm. Dans les oeufs se trouvaient englobées des larves, très longues, surpassant de six fois le diamètre de l'oeuf.

Tout ce dont la science helminthologique dispose sur la question des caractères de l'espèce *Onchocerca fasciata* Railliet & Henry, 1910 est epuisé par ces brefs renseignements.

Dans la monographie de l'acad. K. J. Scriabine et du Dr. Ed. S. Schulz sur les helminthoses des bovidés (12) nous trouvons une indication, que K. J. Scriabine & Shikhobalova se basant sur une description de l'espèce assez superficielle, ont rangé l'*Onchocerca fasciata* parmi les *species inquirendae*.

A. Henry et G. Masson (9) affirment le contraire. En différenciant l'*Onchocerca fasciata* des autres espèces de ce genre, ils se basaient sur deux indices: localisation des *Onchocerca* dans les ligaments du cou et dans le tissu conjonctif contigu où dans les nodules du tissu conjonctif sous-cutané; proportion de la longueur des spicules. A. Henry & G. Masson attirent l'attention sur le fait, que parmi toutes les espèces des onchocercas, se localisant dans le tissu conjonctif sous-cutané — l'*Onchocerca fasciata* présente une vive différence par la longueur de ses spicules, dont le grand est environ trois fois et demie la longueur du petit. En raison du susdit ils considèrent l'indépendance de l'espèce *Onchocerca fasciata* nettement légalisée.

Nous tenons à rappeler, que nous avons découvert l'*Onchocerca fasciata* dans le *ligamentum nuchae* des chameaux. Ainsi l'harmonie de la méthodique différencielle offerte par A. Henry & G. Masson pour la détermination de l'indépendance de l'espèce *Onchocerca fasciata*, se trouve considérablement ébranlée.

D'autre part, nous attirons l'attention, sur la spécificité jusqu'à présent non refutée, des espèces d'*Onchocerca* envers leurs hôtes.

En considération du susdit, nous supposons, qu'il n'y a pas de raisons importantes pour douter de l'indépendance de l'éxistence de l'espèce *Onchocerca fasciata*.

Cela ne doit pas toutefois nous faire éloigner des études, mais tout au contraire nous engager à renforcer nos recherches sur la morphologie de l'*Onchocerca fasciata*.

BIOLOGIE: — Inconnue.
HOTE DÉFINITIF: — *Camelus dromedarius*.
DISTRIBUTION: — Afrique, Inde anglaise, la Turkménie, Afrique Egypte, Eritrée.

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Planche 1

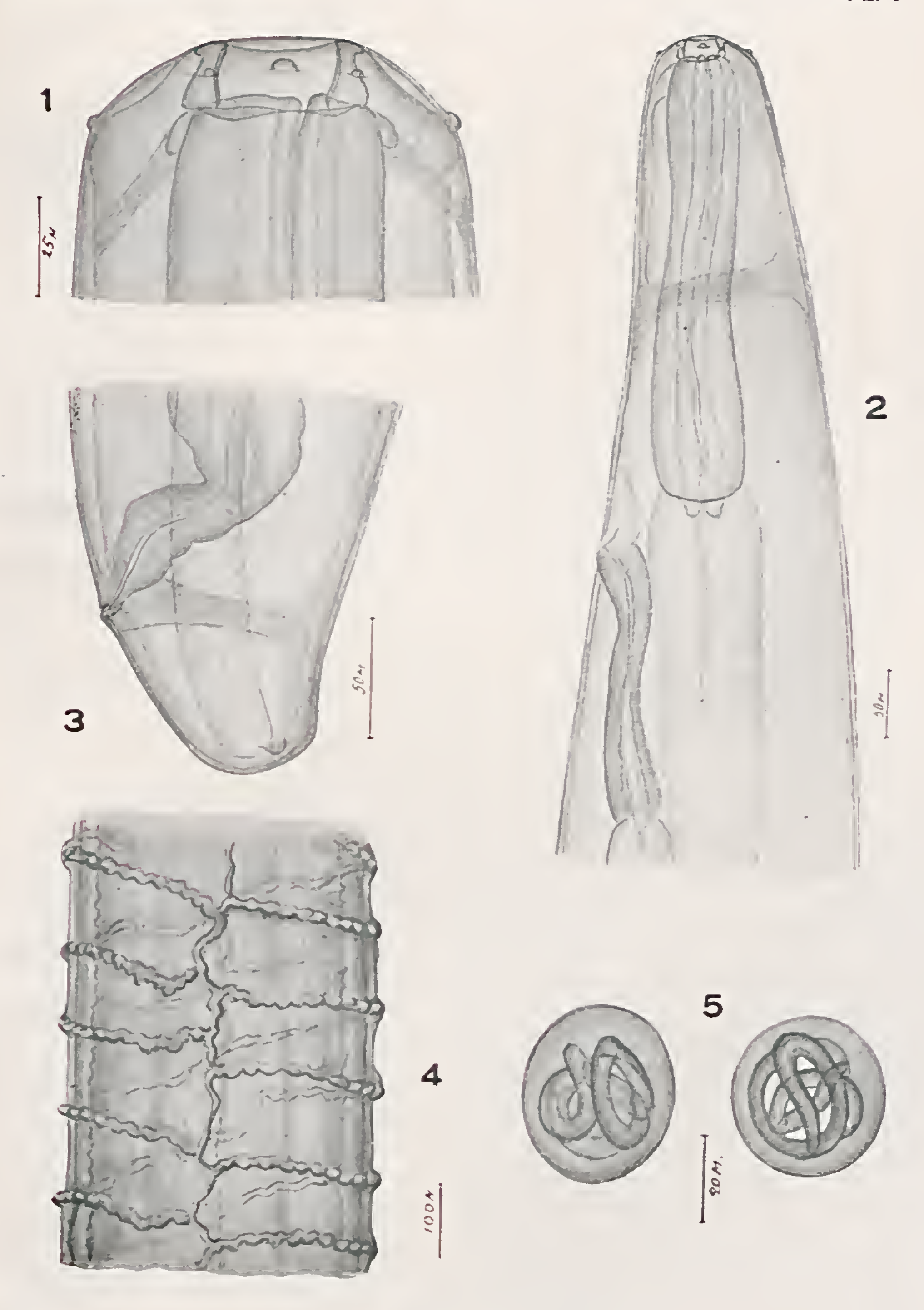
Fig. 1 — *Thelazia leesei* Railliet & Henry, 1910. Extrémité antérieure de la femelle. Orig.

Fig. 2 — *Thelazia leesei* Railliet & Henry, 1910. La partie antérieure du corps de la femelle. Orig.

Fig. 3 — *Thelazia leesei* Railliet & Henry, 1910. L'Extrémité postérieure de la femelle. Orig.

Fig. 4 — *Onchocerca fasciata* Railliet & Henry, 1910. Fragment du corps de la femelle. Orig.

Fig. 5 — *Onchocerca fasciata* Railliet & Henry, 1910. Oeufs, extraits de la matrice de la femelle. Orig.



Badanine : Helminthofaune du chameau.

Duboisiella proloba n. gen., n. sp., un Trématode de la Sarigue, Didelphys aurita L.

Jean G. Baer
Neuchâtel — Suisse

[Avec 2 planches]

INTRODUCTION

En étudiant une petite collection d'helminthes déposée à l'Institut de Zoologie de l'Université de Cologne, nous avons eu notre attention attirée par des Trématodes recueillis dans l'intestin d'une Sarigue, *Didelphys aurita* L. à Santos et qui ressemblaient extérieurement à des Acanthocéphales (fig. 1).

Un examen plus approfondi nous a montré qu'il s'agissait en réalité de Vers appartenant à la super-famille des *Strigeides* Dubois, 1936. Cependant, l'anatomie de nos échantillons est tellement différente de toutes celles connues à ce jour que nous avons jugé nécessaire de créer un nouveau genre pour les y loger.

Nous nous faisons un plaisir de dédier ce genre à notre collègue et ami, le Dr. G. Dubois dont les études si précises sur les *Strigeides* lui ont permis de mettre sur pied la première classification complète de ce groupe (Dubois, 1936).

DESCRIPTION

Nos échantillons ont une longueur totale de 7 mm. 6 à 15 mm. 6, suivant leur état de contraction. Il est possible de diviser le corps du Ver en deux segments, l'un antérieur, ne contenant que l'appareil tribocytique et l'anse de l'utérus, et l'autre, postérieur, ne contenant que les glandes génitales et les conduits sexuels. La limite entre ces deux régions se voit déjà sur les exemplaires non préparés (fig. 1); elle est marquée par un brusque renflement fusiforme. Malgré les différences de contractions assez considérables d'un exemplaire à un autre, on trouve que le rapport numérique moyen du segment antérieur au segment postérieur, est de 2,3 environ. Chez le plus grand exemplaire long de 15 mm. 6, le segment antérieur a 10 mm. 6 et le segment postérieur, 5 mm. et chez l'exemplaire le plus contracté, long de 7 mm. 6, ces mesures sont respectivement de 4 mm. 4 et 3 mm. 2.

En coupe transversale, on voit que le Trématode est cylindrique, le diamètre maximum du segment antérieur étant de 800 microns à 1 mm. et celui du segment postérieur, de 1 mm. à 1 mm. 7.

La ventouse orale, sub-terminale, (fig. 2) a 240 microns de diamètre et une longueur de 218 microns; elle est munie, dans sa partie inférieure, d'un puissant faisceau de fibres circulaires, constituant un volumineux sphincter.

Le pharynx, de grandes dimensions, est presque sphérique; il a 320 microns de diamètre et 352 microns de long. La ventouse ventrale, de très petite taille, est rudimentaire et ne joue probablement plus aucun rôle lors de la fixation de parasite à la muqueuse intestinale de son hôte; elle n'a que 35 microns de diamètre. Il s'ensuit que la ventouse ventrale est presque sept fois plus petite que la ventouse orale. Le pharynx est suivi d'un court oesophage d'où partent les deux diverticules de l'intestin. Ceux-ci cheminent de chaque côté de la ligne médiane, à la face dorsale du Ver, pour venir se terminer latéralement au devant de l'atrium génital.

Ainsi que nous l'avons fait remarquer ci-dessus, la plus grande partie du segment antérieur est occupée par l'organe tribocytique. Ce dernier est de très grande taille, puisqu'il s'étend depuis la bouche jusque dans la région de l'ovaire. Dans le voisinage de la bouche, cet organe présente deux lobes, dont un, le dorsal, est beaucoup plus court que l'autre situé à la face ventrale du premier. Les extrémités distales de ces deux lobes sont libres dans la partie antérieure de la grande cavité cylindrique qui occuppe la majeure partie du segment antérieur (figs. 3-5). Ces deux lobes, ainsi que tout l'organe tribocytique, sont parcourus par des ramifications du système excréteur. Les glandes protéolytiques sont diffuses. A côté de ces glandes, l'organe tribocytique renferme de très nombreux follicules vitellogènes; il est aussi parcouru, sur toute sa longueur, par le tronc principal de l'appareil excréteur.

L'ovaire, presque sphérique, a 510 microns de diamètre. Il se trouve en avant du testicule antérieur, à la limite de bisegmentation du corps, plus rapproché de la face dorsale que de la face ventrale du Ver (fig. 5). L'oviducte prend naissance à la face ventrale de l'ovaire et reçoit en premier, le canal de Laurer. Ce dernier vient déboucher à la face dorsale du Ver, entre l'ovaire et le testicule antérieur. La glande de Mehlis est située en arrière de l'ovaire et légèrement plus rapprochée de la face ventrale que de la face dorsale; dans son voisinage immédiat se trouve un grand réservoir vitellin. Ces deux organes sont situés l'un derrière l'autre entre les lobes du testicule antérieur.

L'utérus, après avoir décrit plusieurs circonvolutions entre les lobes du testicule antérieur, se dirige, à la face ventrale du Ver, dans le segment antérieur, jusqu'à la limite inférieure du premier quart de l'organe tribocytique (fig. 7), là, se repliant sur lui-même, l'utérus suit le même trajet en sens inverse, passe à la face ventrale des testicules pour venir déboucher dans l'atrium génital qui s'ouvre sur le côté dorsal du Trématode. La portion distale de l'utérus a une paroi plus épaisse, formée en grande partie de fibres musculaires longitudinales et circulaires (fig. 6). Les oeufs ont 115 microns de long sur 65 microns de diamètre. Les glandes vitellogènes ne se trouvent que dans le segment antérieur du Ver. Les follicules sont disséminés dans le parenchyme sur les faces latérales, ainsi qu'à l'intérieure de l'organe tribocytique (figs. 4 et 5), le parenchyme des faces dorsale et ventrale du Ver ne contient pas de follicules vitellogènes.

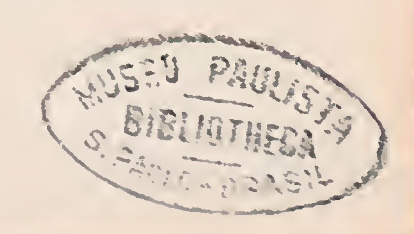
Les deux testicules, situés l'un au devant de l'autre dans le segment postérieur, ont une forme difficile à définir. Ils sont multilobés, tous les lobes étant dirigés en arrière de sorte que sur des coupes horizontales, les testicules apparaissent sous forme de fers-à-cheval plus ou moins renflés (fig. 7). Les deux canaux efférents confluent en arrière de l'ovaire pour former le canal déférent qui débouche dans une grosse vésicule séminale contournée sur elle-même, située en entier, en arrière du testicule postérieur. Cette vésicule séminale s'ouvre

dans un organe ovoïde, long de 800 microns, ayant 100 microns de diamètre, avec une paroi musculaire très épaisse formée presque essentiellement de fibres circulaires. Cette poche musculaire est évidemment un organe éjaculateur, servant à projeter le liquide séminal dans la partie terminale du conduit sexuel mâle et en particulier dans un deuxième organe musculaire qui lui fait suite. Ce deuxième organe, long de 1 mm. 2 est fusiforme, ses parois épaisses, tout en étant plus minces que celles de la vésicule éjaculatrice sont formées presque exclusivement de fibres longitudinales disposées sur plusieurs couches concentriques groupées en faisceaux (fig. 6). La lumière de cet organe est tapissée d'un épithélium dans lequel sont implantées de longues soies rigides dont l'enchevêtrement remplit complètement l'organe. La gaine musculaire longitudinale est entourée, sur toute sa longueur, d'un fort manchon de cellules. Ces dernières ont une structure nettement glandulaire et débouchent par de fins canaux dans la lumière de l'organe. L'ensemble de cet appareil, à la fois musculaire et glandulaire, constitue ainsi une prostate volumineuse faisant suite à la poche éjaculatrice et venant déboucher avec l'utérus dans l'atrium génital.

DISCUSSION

Avant de chercher à établir la position systématique de notre Trématode nous jugeons nécessaire de préciser le sens morphologique qu'il faut attribuer à la prostate chez les *Strigeides*. En effet, on reconnait aujourd'hui dans ce groupe deux types fondamentaux de prostates. Chez les *Proterodiplostomidae* Dubois, 1936 et en nous référant au travail récent de Dubois (1936 a), la prostate est toujours un organe indépendant des conduits sexuels mâles, venant déboucher dans le voisinage immédiat du canal hermaphrodite. Cette prostate peut avoir une paroi musculaire, épaisse, comme dans le genre *Crocodilicola* Poche, 1925 par exemple. Chez les *Diplostomidae* Poirier, 1886, dans le genre *Podospathalium* Dubois, 1932 et chez *Podospathalium pedatum* (Diesing, 1850) (Dubois, 1931), la prostate se présente sous forme d'un manchon cellulaire entourant le canal éjaculateur; les cellules prostatiques débouchant directement dans ce dernier. Il est possible que la fonction physiologique de ces deux types de prostates soit la même, cependant, il est de toute importance de les distinguer l'une de l'autre au point de vue morphologique et partant, systématique. Afin d'éviter des malentendus dans la suite, nous nous proposons de nommer *périprostate* le type de prostate rencontré chez *Podospathalium*, c'est à dire, un manchon de cellules entourant le canal éjaculateur et y débouchant directement, et *paraprostate*, le type de prostate rencontré chez les *Proterodiplostomidae*, c'est à dire, un organe plus ou moins musclé dans lequel viennent déboucher les cellules prostatiques, et dont l'ouverture se trouve le plus souvent dans le voisinage immédiat du canal hermaphrodite. Cette terminologie permettra de définir les genres sans aucune équivoque, d'autant plus que la paraprostate ainsi définie, ne se rencontre que chez les parasites de Reptiles.

La position systématique de notre Trématode n'est pas facile à établir. Si nous nous rapportons aux principes de classification établis par Dubois (1936) pour la superfamille *Strigeides* Dubois, 1936, nous voyons d'emblée que notre genre doit se situer dans la sous-superfamille *Strigeines* Dubois, 1936 puisqu'il présente les caractères requis, à savoir: « Segment antérieur cupuliforme ou utriforme. Organe tribocytique formé de deux lobes linguiformes,



rétractiles ». Cependant, aucun genre des *Strigeidae* Railliet, 1919 n'a été cité chez les Mammifères ni ne possède de follicules vitellogènes confinés au seul segment antérieur, nous nous voyons ainsi dans l'obligation de créer une nouvelle sous-famille pour y loger notre genre. Nous la définirons de la façon suivante:

Duboisiellinae n. subfam.

Strigéidés avec follicules vitellogènes confinés dans le segment antérieur; parasites de Mammifères.

La diagnose du genre sera ainsi:

Duboisiella n. gen.

Corps cylindrique légèrement recourbé dorsalement; le segment antérieur, tubuliforme, en tous cas deux fois plus long que le segment postérieur. Ventouse ventrale rudimentaire. Organe tribocytique bilobé, le lobe ventral immense s'étendant jusqu'à l'ovaire. Glandes protéolytiques diffuses, sans localisation bien définie. Follicules vitellogènes situés en entier dans le segment antérieur, répartis latéralement ainsi que dans l'organe tribocytique. Ovaire en avant des testicules, ces derniers situés l'un derrière l'autre. Glande de Mehlis et réservoir vitellogène l'un derrière l'autre au niveau du testicule antérieur. Présence d'une poche éjaculatrice fortement développée et d'une périprostate musculeuse de très grande taille. Utérus s'étendant dans le segment antérieur, se repliant sur lui-même en passant ventralement à la périprostate pour déboucher dans l'atrium génital.

ESPÈCE TYPE: — *Duboisiella proloba* * n. sp.

RÉSUMÉ

Nous décrivons sous le nom de *Duboisiella proloba* n. gen., n. sp. un nouveau *Strigeidae* trouvé chez *Didelphys aurita* L. Ce genre est caractérisé par l'allongement considérable du segment antérieur qui est tubuliforme et qui contient un organe tribocytique très long. Appareil mâle avec poche éjaculatrice et une périprostate musculeuse. Nous avons jugé nécessaire de créer la nouvelle sous-famille *Duboisiellinae* n. subfam. pour y loger notre genre.

ZUSAMMENFASSUNG

Wir beschreiben unter den Namen *Duboisiella proloba* n. gen., n. sp. ein neues Genus der *Strigeidae* aus *Didelphys aurita* L. Dieses Genus ist charakterisiert durch die starke Verlängerung des Vorderkörpers, welcher zylindrisch ist und ein langes tribocytisches Organ enthält. Der männliche Geschlechts-Apparat besitzt eine Propulsionsblase und eine muskulöse Periprostata. Wir

* *proloba* de ὁ πρόλοβος jabol des Oiseaux, à cause de la très grande cavité du segment antérieur qui forme une sorte de jabol.

haben es notwendig gefunden, die neue Unterfamilie der *Duboisiellinae* n. subfam. zu schaffen, um unser neues Genus einfügen zu können.

SUMMARY

We describe under the name of *Duboisiella proloba* n. gen., n. sp. a new genus of *Strigeidae* from *Didelphys aurita* L. This genus is characterised by a considerable lengthening of the anterior half of the body which is cylindrical and contains a very long tribocytic organ. The male genitalia possess an ejaculatory pouch communicating with a very muscular periprostata. We have found it necessary to create a new subfamily *Duboisiellinae* n. subfam. to contain our genus.

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Planche 1

Duboisiella proloba n. gen., n. sp. Photographie agrandie des Vers non-préparés.



Baer: *Duboisiella proloba* n. gen., n. sp.

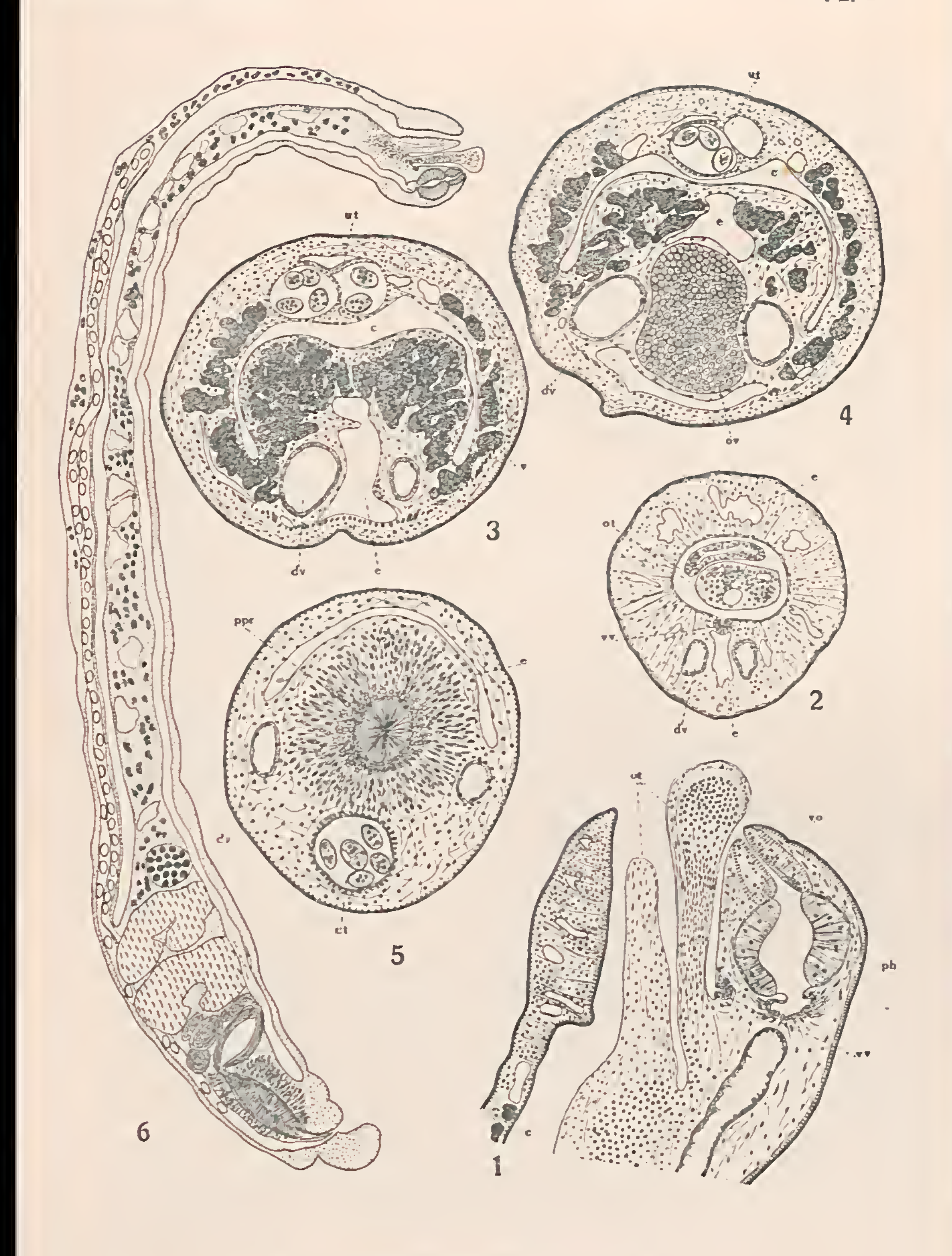
Planche 2

Duboisiella proloba n. gen., n. sp.

Fig. 1 — Coupe sagittale de la région antérieure.
Fig. 2 — Coupe transversale passant au niveau de la ventouse ventrale.
Fig. 3 — Coupe transversale montrant le volumineux organe tribocytique.
Fig. 4 — Coupe transversale passant au niveau de l'ovaire.
Fig. 5 — Coupe transversale passant à travers la périprostate.
Fig. 6 — Coupe sagittale du Ver entier montrant la topographie des organes.

Abbréviations utilisées

C. — cavité du segment antérieur; dv. — diverticules de l'intestin; e. — vaisseau excréteur; ot. — organe tribocytique; ov. — ovaire; ph. — pharynx; ppr. — périprostate; ut. — utérus; v. — follicules vitellogènes; vo. — ventouse orale; vv. — ventouse ventrale.



Baer: *Duboisiella proloba* n. gen., n. sp.

On a new Trematode, Travassosstomum natritis n. g., n. sp., from the intestine of the Indian River-Snake, Natrix piscator (Schneider)

Dr. G. D. Bhalerao
Helminthologist, Imperial Veterinary Research Institute, Muktesar, India

[With 2 text-figures]

About two dozen specimens of worms were obtained in 1930 at Nagpur from the intestine of the Indian River-Snake, *Natrix piscator* (Schneider) along with several specimens of *Acanthostomum burminis* (Bhalerao, 1926). The specimens appeared very interesting and on examination proved new to science. It is proposed to give here an account of these interesting parasites and to discuss their affinities in the subsequent part of this communication.

The entire worms are cylindrical and measure 1.685-1.62 mm. in length The body is divided in two portions, a small anterior portion and a large posterior one. The anterior portion is somewhat globular, hollowed out ventrally and flexed dorsally as often is the case in the worms belonging to this class of parasites. It appears like a saucer and measures 0.525-1.01 $\times$ 0.715-1.06 mm. The anterior most part of the body is triangular, a condition which is brought about by the presence of two cup-like depressions or pseudosuckers lying at its base. These peudosuckers appears like pits and in their connection strong longitudinal muscle fibres are noticed. The hind-body is cylindrical and is attached to the convex dorsal side of the fore-body. It is broadest anteriorly and diminishes in width very gradually posteriorly, terminating in a rounded posterior extremity.

At the apex of the triangular portion of the fore-body is the terminal mouth which is surrounded by the oral sucker measuring 0.115-0.13 mm. in diameter. It is followed by a very short prepharynx measuring approximately 0.07 mm. in length.

The pharynx is almost globular and measures 0.062-0.071 mm. in diameter. The oesophagus is very short and measures 0.033-0.052 mm. in length. The intestinal caeca pass posteriorly and terminate slightly posterior to the midbody in fully grown specimens, but in the younger forms they are situated nearer the posterior end of the body. In one immature specimen were the caeca seen to terminate at the posterior fourth of the body. Evidently as the uterus developes the posterior portion of the body grows more and more in length, the caeca, however, do not undergo further growth. The ventral sucker is almost round and measures 0.08-0.11 mm. in diameter. In some specimens it is seen to underlie the intestinal fork while in others it lies distinctly posterior to it. The holdfast organ is of moderate size and measures 0.4-0.7 mm. in diameter. It is almost round in shape, but in lateral view, it appears to be somewhat elliptical. It is capable of protrusion and in such condition appears like a

toad-stool, a circular disc supported on a short, thick pedicel. Its anterior border lies in the pharyngeal region while its posterior border is almost at the middle of the fore-body. The adhesive gland is compact and is situated over the posterior border of the holdfast organ.

The cuticle is thick and is completely devoid of any armature. In the lateral region of the holdfast organ it is very much thickened. In the fore-body the parenchyma is traversed by numerous powerful longitudinal muscle fibres which converge anteriorly towards the pseudosuckers and are inserted on the thick cuticle of these organs. The longitudinal muscle fibres continue also in the hind-body and give it a striated appearance. The holdfast organ, as usual, has the dorso-ventral muscle fibres.

The excretory system was studied in detail in series of transverse and longitudinal sections. The excretory aperture lies on the ventral surface close to the posterior extremity of the body. It leads into two wide principal ventral canals which pass anteriorly almost up to the level of the anterior testis. At the level of the ovary the two main canals unite together and form a common canal which passes anteriorly, almost as far as the anterior end of the posterior body portion. At this place it divides into two large branches, one of which enters the adhesive organ and the other passes dorsally. The branch entering the adhesive organ divides into two sub-branches which ramify in that organ. The dorsal branch also divides into two, one of which goes towards the oesophagus and the oral sucker and the other passes towards the ventral sucker. Two lateral longitudinal canals open into the main excretory canals near the excretory aperture. These could be traced anteriorly to slightly in front of the ovary. Besides the main system as described above there are highly developed sub-cutaneous plexi consisting of a network of vessels of varying sizes. This sub-cutaneous element of the excretory system is characteristic of the worms classed generally as «Holostomes». Contrary to the observation of Krause (1915) and of Yamaguti (1933) the excretory network of the holdfast organ does not lie directly underneath the cuticle uniformly throughout this organ, but may do so only at some places.

The testes are transversally oval and lie one behind the other in the anterior half of the posterior portion of the body. The anterior testis measures 0.13-0.3 × 0.12-0.26 mm. and the posterior one measures 0.15-0.32 × 0.14-0.23 mm. The vas efferens of the anterior testis is very short and arises from its posterior border of the ventral side. The vas efferens of the posterior testis arises from its anterior border of the ventral side and is much longer. It meets with the vas efferens of the anterior testis postero-ventral to the latter. The vas deferens is very much coiled in the inter-testicular area. It passes posteriorly either ventral to or partially overlapping the posterior testis. Close behind the latter organ it enlarges into a coiled and moderately large vesicula seminalis.

Following this latter is a long ductus ejaculatorius which passes posteriorly in a slightly convoluted manner. There is a complete absence of pars prostatica. For *Proalarioides serpentis* Yamaguti (1933) describes «A short pars prostatica arising from the vesicula seminalis is surrounded by prostatic cells diffusely embedded in the surrounding parenchyma». A thorough attempt was made to discover a similar structure in the specimens at my disposal by examination of eight entire mounts and six sectionized series, but no such structure or any thing simulating it was noticeable. There is no cirrus.

The ovary is almost round and lies centrally close in front of the anterior testis. It measures 0.035-0.065 mm. in diameter. The uterus is first seen in the intertesticular area. It passes anteriorly as far as the anterior end of the

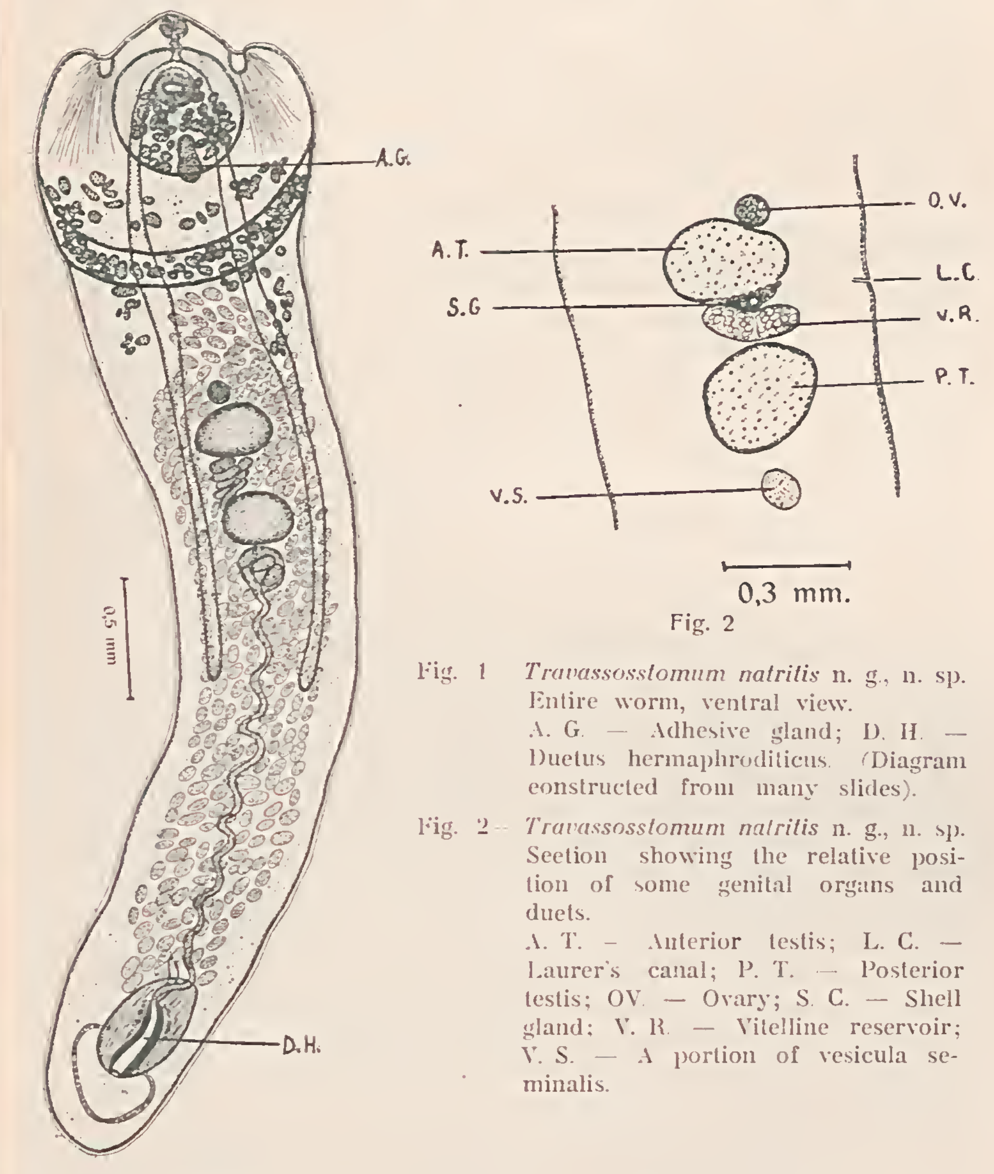


Fig. 2

Fig. 1

Fig. 1 *Travassosstomum natritis* n. g., n. sp. Entire worm, ventral view. A. G. — Adhesive gland; D. H. — Ductus hermaphroditicus. (Diagram constructed from many slides).

Fig. 2 — *Travassosstomum natritis* n. g., n. sp. Section showing the relative position of some genital organs and ducts. A. T. — Anterior testis; L. C. — Laurer's canal; P. T. — Posterior testis; OV. — Ovary; S. C. — Shell gland; V. R. — Vitelline reservoir; V. S. — A portion of vesicula seminalis.

hinder portion of the body. It then passes posteriorly almost as far as the ends of the intestinal caeca. From here it once more proceeds anteriorly and returns back posteriorly, extending as far as the anterior end of the muscular bulb,

presently to be described. The distal portion of the uterus is comparatively much thinner. It joins with the distal portion of the ductus ejaculatorius and forms the ductus hermaphroditicus which is lined with thick cuticle internally and which opens at the apex of the conical muscular bulb projecting into the genital atrium. The muscular bulb surrounds the entire ductus hermaphroditicus as well as the terminal portions of the uterus and the ductus ejaculatorius. The genital atrium is situated subterminally on the ventral side at the posterior end. The shell gland lies on the postero-dorsal side of the anterior testis. The Laurer's canal proceeds dorsally and opens more or less at the same level as that of the centre of the shell gland. There is no receptaculum seminis. The vitellaria are follicular. The follicles are very closely situated along the postero-lateral margin of the anterior portion of the body and are here disposed in a layer of about three follicles deep. The follicles are also closely situated dorsally to the posterior two-third of the holdfast organ. Between these two regions the follicles are rather sparse. In the anterior region of the posterior portion of the body a few follicles are also present. Paired vitelline ducts pass along the ventral side of the intestine. The vitelline reservoir is seen in the intertesticular region close behind the shell gland. The ova in the uterus are large, operculate, segmented and measure 0.097-0.11 × 0.05-0.072 mm.

« Holostomes » have been subjected to classification in the past by several authors such as Brandes (1888, 1890), La Rue (1926), Szidat (1929) and Dubois (1932). Recently Dubois (1936) published a detailed scheme of the classification of this class of worms. Refering to this scheme it is found that the worms of reptiles have been grouped together under the family *Proterodiplostomidae* Dubois, 1936. The worms described above agree with all the characteristics of this family excepting the fact that it lacks the presence of pars prostatica. Among the genera placed under this family it agrees with *Proalarioides* Yamaguti, 1933. Unlike other genera of this family this genus has only short pars prostatica arising from the vesicula seminalis. Excepting this feature the specimens at my disposal have a close affinity to this genus. Thus it will be evident from the foregoing account that my specimens agree with it in respect of the general form of the body, the presence of the pseudosuckers, the posterior extent of the intestinal caeca, the general topography of the genital organs, the distribution of the vitellaria and, above all, in the presence of the ductus hermaphroditicus. Apart from these points of agreement my specimens differ from *Proalarioides* in several important respects. For this reason it is proposed to create a new genus for their reception for which the name *Travassosstomum* is proposed in honour of Professor L. Travassos of Rio de Janeiro. Dubois places the genus *Proalarioides* in the subfamily *Ophiodiplostominae* along with three other genera, *viz.*, *Ophiodiplostomum*, *Petalodiplostomum* and *Heterodiplostomum*. A comparative review of the characters of these four genera indicates that *Proalarioides* stands out quite distinct from the other three genera in that it possesses pseudosuckers, ductus hermaphroditicus and its pars prostatica is very rudimentary. The other three genera do not possess either the pseudosuckers or the ductus hermaphroditicus, while the pars prostatica in them is very well developed and does not arise from the vesicula seminalis as in *Proalarioides*. For these reasons it is proposed to remove the genus *Proalarioides* from the subfamily *Ophiodiplostominae* and include it in the new subfamily *Travassosstominae* with the following diagnosis.

Travassosstominae n. sfam.

Parasites of snakes. Pseudosuckers present. Ductus hermaphroditicus present. Ductus hermaphroditicus and the terminal portions of the genital ducts enclosed by a muscular bulb. Pars prostatica absent or rudimentary.

TYPE GENUS: — *Travassosstomum* n. g.
OTHER GENUS: — *Proalarioides* Yamaguti, 1933.

Travassosstomum n. g.

Body divided into two portions. Anterior portion hollowed out and much smaller than cylindrical posterior portion. Pseudosuckers conspicuous. Holdfast organ of moderate size, almost round, extending from pharynx. Adhesive gland compact, at posterior border of holdfast organ. Intestinal caeca terminating slightly behind midbody. Testes in anterior half of body, one behind the other. Vesicula seminalis large, immediately behind posterior testis. Ductus ejaculatorius very long. Pars prostatica absent. Ovary round, immediately in front of anterior testis. Receptaculum seminis absent. Laurer's canal present. Shell gland and vitelline reservoir intertesticular. Vitellaria mainly in anterior portion of body. Ductus hermaphroditicus present. Terminal portions of genital ducts and ductus hermaphroditicus enclosed in a muscular bulb. Ova numerous, large, operculated. Genital aperture ventral, subterminal.

TYPE SPECIES: — *Travassosstomum natritis* n. sp.

Travassosstomum natritis n. sp.

Travassosstomum. — Length 1.685-4.62 mm. Hind-body about four times longer than fore-body. Mouth terminal. Prepharynx and pharynx present. Oesophagus very short. Intestinal caeca extending from one-half to three-fourths of hindbody. Holdfast organ almost circular, 0.4 - 0.7 mm. dia. Ventral sucker 0.08-0.14 mm. dia. Adhesive gland compact, situated over posterior border of holdfast organ. Testes transversely oval, 0.13-0.32 × 0.12-0.26 mm. Vesicula seminalis moderately large. Ovary 0.035-0.065 mm. dia. Uterine coils extending from muscular bulb to anterior end of hind-body. Vitelline follicles thick along the postero-lateral border of fore-body and over the holdfast organ, sparse elsewhere. Ova 0.097-0.11 × 0.05-0.072 mm.

HOST: — *Natrix piscator* (Schneider).
LOCATION: — Small intestine.
LOCALITY: — Nagpur (Central Provinces, India).

Types and paratypes to be deposited in the Helminthological collection of the Imperial Veterinary Research Institute, Muktesar, India.

In view of our recent knowledge the diagnosis of the family *Proterodiplostomidae* may be amended as follows: —

« The pars prostatica may be present, rudimentary or absent ».

SUMMARY

A new species of trematode belonging to a new genus, *Travassosstomum natritis*, has been described.

Diagnosis of the new genus *Travassosstomum* has been given. A new subfamily has been formed to include *Travassosstomum* and *Proatarioides*. Diagnosis of the new subfamily *Travassosstominae* has been given. An amendment is suggested to the diagnosis of the family *Proterodiplostomidae*.

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Um novo genero de Phorideos de Santa Catharina

(Dip. Phoridae)

T. Borgmeier
Instituto de Biologia Vegetal, Secção de Entomologia, Rio de Janeiro — Brasil

[Com 1 figura]

Entre muitas centenas de Phorideos recebidos do Snr. Fritz Plaumann (Nova Teutonia, Sta. Catharina) encontrei um exemplar, que constitúe um genero novo, que dedico ao meu amigo Prof. Dr. Lauro Travassos, em cuja homenagem é publicado o presente volume.

Travassophora nov. gen.

Macho: — Terceiro articulo antennal de tamanho normal ligeiramente conico (como em *Puliciphora*); arista apical. Palpos do macho muito compridos. Ha 2 cerdas supra-antennaes porrectas (não proclinadas) e divergentes. Cerdas lateraes anteriores e médias provavelmente ausentes. Olhos finamente pubescentes. Anepisterno dividido, desnudado. Escutello com 2 cerdas. Hypopygio asymetrico; tubo anal curto. Tibias sem cerdas isoladas e sem fileira dorsal de pêlos. Aza hyalina, lóbulo anal bem desenvolvido, sem pêlos no logar da alula; nervura mediastinal ausente; nervura costal curta, com cilios curtos; primeira nervura (no genotypo) só accusada na base, no mais apagada; terceira nervura não bifurcada; as demais nervuras muito pallidas.

Femea desconhecida.

GENOTYPO: — *Travassophora plaumanni* n. sp.

Este genero curioso pertence sem duvida á subfamilia *Metopininae*, tal como foi definida por Schmitz. No emtanto, pelos caracteres que apresenta, é bastante aberrante. Entre os generos cujas tibias são desprovidas de uma fileira dorsal de pêlos e cujas azas não apresentam pêlos na alula (como *Holopterina* Borgm., *Puliciphora* Wandoll., *Ecitophora* Schmitz, *Xanionotum* Brues, etc.) não conheço nenhum, ao qual o novo genero possa ser comparado. A nervação da aza se parece até certo ponto com *Pseudohypocera* Mall.; mas no novo genero a primeira nervura é quasi totalmente apagada, a terceira nervura não é bifurcada e o lobulo anal é muito mais desenvolvido. Este ultimo caracter é extraordinario e lembra certos *Platypezidae*, familia essa com que os Phorideos teem relações phylogeneticas; não conheço nenhum genero de Phorideos que tenha o lóbulo anal da aza tão desenvolvido como o genero aqui descripto. Outro caracter excepcional é a ausencia parcial da primeira nervura. Segundo Brues, essa nervura falta completamente nos machos de *Ecitomyia*

wheeleri Brues; no emtanto, possúo numerosos machos indescriptos de *Ecitomyia* e em todos elles a primeira nervura é distincta.

Travassophora plaumanni n. sp.

Cabeça no exemplar holotypo muito corrugado. Fronte preta, mate, com pubescencia esparsa, duas vezes mais larga do que comprida nos lados, sem sulco mediano. As cerdas frontaes são finas e moderadamente compridas. Ha 2 cerdas supra-antennaes porrectas (ou reclinadas?) e divergentes; 2 cerdas antiaes que se inserem no bordo frontal anterior perto da margem ocular; 2 cerdas preocellares que distam um pouco mais do ocello anterior do que das antiaes. Cerdas lateraes anteriores e médias provavelmente ausentes. Bordo vertical com 4 cerdas (2 ocellares e 2 lateraes posteriores); além disso de cada lado 1 cerda postical inclinada para a linha mediana. Olhos com pubescencia muito fina; cilios oculares curtos. Genas com alguns pêlinhos. Orificio buccal pequeno; tromba muito curta. Palpos muito compridos (0,3 mm.) e delgados, mais ou menos tão compridos como o metatarso posterior mas mais largos, pardo-ennegrecidos, com 4 pêlos (ou cerdinhas) curtos e finos: 1 no meio 1 no 3.º quarto e 2 no apice. Terceiro articulo antennal pardo-escuro, de tamanho normal, conico; arista apical, comprida, distinctamente pubescente.

Thorax pardo-escuro, com pubescencia curta e escassa; pleuras ligeiramente ferruginosas. Cerdas prothoracicas curtas e finas; ha 2 cerdas dorsocentraes. Mesopleuras desnudadas. Escutello com 2 cerdas.



Fig. 1 — *Travassophora plaumanni* n. g., n. sp. Aza do holotypo
Santos Lahera phot.

Abdomen pardo-ennegrecido, mate; tambem o ventre escuro. Pubescencia curta e extremamente escassa. Todos os tergitos de formação normal; tergito 2 um pouco prolongado, 4 e 5 de comprimento igual, 6 tão comprido como o terceiro; todos os tergitos mais largos do que compridos, rectangulares. Hypopygio amarellado, com poucos pêlos curtos; tubo anal curto; styli não differenciados.

Patas delgadas, pardo-ferruginosas. Metatarso anterior mais ou menos tão comprido como os dois seguintes articulos addicionados. Tibias médias e posteriores com um esporão ventral curto, sem fileira de pêlos na face dorsal; pubescencia adjacente escassa. Metatarso posterior pouco dilatado.

Aza comprida (2,07 mm.) e larga (1,05 mm.), membrana muito hyalina, nervuras do bordo anterior amarello-pallidas. Nervura costal curta, 0,38 mm. do comprimento da aza, com 28 pares de cilios curtos. Nervura humeral transversal presente; mediastinal ausente. Primeira nervura longitudinal sómente accusada na base, no mais apagada. Terceira nervura não forquilhada, ligeiramente engrossada no quarto apical e com pequena saliencia tuberculiforme no logar onde nasce a quarta nervura. Nervuras 4-6 muito pallidas não attingindo bem a orla da aza; quarta nervura quasi recta, só na base ligeiramente curvada; setima nervura muito indistincta, quasi inteiramente apagada. Lóbulo anal da membrana bastante desenvolvido; no logar da alula não ha pêlos.

Halteres pardo-ocraceos.

Comprimento total 1,75 mm.

HOLOTYPO: — Macho, proveniente de Nova Teutonia, Santa Catharina, Brasil, Fritz Plaumann leg., 10. VI. 1936, na janella do porão.

Contribución al conocimiento de los Nematodos de las aves de México. V.

Eduardo Caballero y C.
Instituto de Biología de México

[Con 2 láminas]

El presente estudio constituye la quinta contribución al conocimiento de los Nematelmintos que parasitan a las aves de México. El material que procede de diversas aves de distintos lugares de nuestro País nos ha permitido describir dos especies nuevas y hacer la redescripción de una especie perteneciente al género *Physaloptera*.

La especie nueva de la Subfamilia *Aproctinae* ha sido dedicada al eminente helmintólogo brasileño Dr. don Lauro Travassos.

Familia. — *PHYSALOPTERIDAE* Leiper, 1908.

Subfamilia. — *PHYSALOPTERINAE* Railliet & Henry, 1893.

Género. — *PHYSALOPTERA* Rudolphi, 1819.

Physaloptera (Physaloptera) acuticauda Molin, 1860.
(Lámina 1).

En el intestino de un aguililla, *Buteo borealis*, fueron encontrados numerosos ejemplares de este nemátodo cuyo cuerpo es de color blanco, grueso, de extremos atenuados, principalmente en la hembra y de cutícula estriada transversalmente.

Macho: — Los machos son más pequeños que las hembras; provistos de una vesícula caudal bien desarrollada, miden 30 mm. de longitud por 1 mm. de anchura; los labios están provistos de un diente mediano externo y uno interno tripartito, de dos papilas situadas laterodorsal y lateroventralmente; el esófago anterior mide 0.630 mm. de largo por 0.087 mm. de ancho y el posterior de 3.850 mm. de largo por 0.385 mm. de ancho; el anillo nervioso se encuentra a 0.172 mm. del extremo anterior; la papila cervical está situada de 0.875 mm. a 1.050 mm. del extremo anterior; el ano se encuentra de 1.295 mm. a 1.435 mm. del extremo posterior.

La vesícula caudal está provista en su porción ventral, de numerosos tubérculos; existen cuatro pares de papilas laterales de pedúnculo largo, arreglados en la forma siguiente: dos pares preanales y dos postanales; el sistema de papilas ventrales se arregla de la manera siguiente: rodeando al ano, hacia adelante, tres pequeñas papilas y por detrás de él cuatro; a partir del nivel del último par de papilas laterales de pedúnculo largo hacia el extremo poste-

rior existen, también, tres pares de papilas ventrales, mayores que las anteriores, dos muy próximos y el tercero cerca del fin del extremo posterior; las espículas son desiguales, la de la derecha mide 2.012 mm. de largo por 0.035 mm. de ancho y la de la izquierda 0.787 mm. de largo por 0.035 mm. de ancho.

Hembra: — La hembra presenta el extremo posterior terminado en punta; en la extremidad cefálica la cutícula se encuentra ensanchada; mide de 36 mm. a 40 mm. de largo por 1 mm. de ancho; la parte anterior del esófago mide 0.752 mm. de largo por 0.175 mm. de ancho y la posterior 1.375 mm. de largo por 0.455 mm. de ancho; el anillo nervioso está a 0.525 mm. del extremo anterior; la papila cervical se encuentra a 1.190 mm. del extremo anterior; el ano se abre a 0.997 mm. del extremo posterior; la vulva está situada en la porción anterior del cuerpo del animal, al nivel del principio del intestino, a 5.775 mm. del extremo anterior; el útero es doble y sus dos ramas se desprenden directamente del receptaculum ovorum; el ovario está alojado en el extremo posterior, los huevos están provistos de una cáscara lisa y miden 0.052 mm. de largo 0.035 mm. de ancho.

HUÉSPED: — *Buteo borealis.*
LOCALIZACIÓN: — Estómago.
DISTRIBUCIÓN GEOGRÁFICA: — México.

Ejemplares en la colección Helmintológica del Instituto de Biología de México.

Discusión. — La descripción de nuestros ejemplares difiere en muy pocos detalles de las hechas por Ortlepp y por Cram, tan sólo en las dimensiones de los huevos y en las de los machos y hembras pues la estructura del aparato genital de la hembra es idéntica a la descrita por Schulz.

Familia. — *THELAZIIDAE* Railliet, 1916

Género: — *OXYSPIRURA* Drasche & Stossich, 1897.

Oxyspirura crassa n. sp.

(Lámina 1).

Los ejemplares que nos sirvieron para este estudio fueron colectados en la cavidad orbitaria de un buho, por el Sr. Mario del Toro Avilés, quien los puso a nuestra disposición para su estudio.

Macho: — Parásitos de color blanco-amarillento, con los extremos del cuerpo terminados en punta; la cutícula se halla finamente estriada transversalmente; el extremo anterior está desprovisto de labios y la boca se abre directamente mediante un amplio atrio; papilas presentes y arregladas de acuerdo con la diagnosis de este género. Miden de 18 mm. a 20 mm. de largo por 0.172 mm. a 0.190 mm. de ancho; la longitud del atrio es de 0.035 mm. a 0.038 mm. y el diámetro de 0.035 mm.; el esófago consta de una sola porción y presenta en su extremo posterior un ligero ensanchamiento; mide de 1.575 mm. a 1.662 mm. de largo por 0.175 mm. de ancho; el anillo nervioso está

situado de 0.297 mm. a 0.315 mm. del extremo anterior y la papila cervical a 0.385 mm. del mismo extremo.

El extremo caudal se presenta casi siempre enrollado, con el ano a 0.437 mm. ó 0.455 mm. del extremo posterior; ausencia de ala caudal; siete pares de papilas preanales bien desarrolladas y siete de papilas postanales· gubernaculum presente; las espículas son desiguales. una más gruesa que la otra, ambas estriadas; la mayor mide de 0.455 mm. a 0.516 mm. de largo por 0.021 mm. de ancho y la menor de 0.175 mm. a 0.182 mm. de largo por 0.021 mm. de ancho.

Hembra: — La hembra es mayor en tamaño que el macho, mide de 25 mm. a 30 mm. de largo por 0.612 mm. a 0.700 mm. de ancho; la longitud del atrio es de 0.042 mm. a 0.045 mm. y el diámetro de 0.042 mm.; el esófago mide de 1.925 mm. a 2.117 mm. de largo por 0.210 mm. de ancho; el anillo nervioso está situado 0.329 mm. ó a 0.350 mm. del extremo anterior; la papila cervical se halla a 0.437 mm. del mismo extremo; el ano se encuentra a 0.612 mm. del extremo posterior.

La vulva se abre en la porción posterior del cuerpo del animal, por delante del ano, a 1.540 mm. del extremo posterior; el útero es doble; los huevos miden 0.056 mm. de largo por 0.028 mm. de ancho, están provistos de una cáscara lisa y encierran una larva en el momento de ser expulsados.

HUÉSPED: — *Bubo virginianus melancerus.*

LOCALIZACIÓN. — Cavidad orbitaria.

DISTRIBUCIÓN GEOGRÁFICA — Estado de Morelos, México.

TIPO: — En la colección de Helmintología del Instituto de Biología. de México.

COTIPOS. — En el Instituto Oswaldo Cruz y en U. S. National Museum, Hel. Coll. N.º 9047.

Discusión. La especie que aquí instituímos difiere de *Oxyspirura cephaloptera* por el número y arreglo de las papilas postanales y por otros detalles anatómicos, como son la ausencia de las expansiones cuticulares cefálicas.

Familia. — *FILARIIDAE* (Cobbold, 1864) Claus, 1885.

Subfamilia. — *APROCTINAE* Yorke & Maplestone, 1926.

Género. *APROCTA* Linstow. 1883.

Aprocta travassosi n. sp.

(Lámina 2).

Los ejemplares de estos Nemátodos provienen de los ojos de um «trogon» *(Curucujus massena)* macho y fueron colectados por el señor Mario del Toro Avilés

Macho: — El cuerpo de estos parásitos es corto, delgado y de color rosado en vivo, tornándose amarillento en ejemplares fijados; el extremo anterior termina ligeramente en punta y el posterior es romo y truncado; la cutícula es

lisa; la longitud es de 15 mm. y el ancho de 0.120 mm.; la boca es simple, desprovista de atrio y rodeada por 8 papilas externas relativamente grandes y 6 internas pequeñas; el esófago presenta un ensanchamiento en su porción anterior, midiendo 0.110 mm. de largo por 0.052 mm. de ancho y el resto es cilíndrico, está desprovisto de bulbo posterior y mide 0.805 mm. de largo por 0.105 mm. de ancho; el anillo nervioso se encuentra a 0.140 mm. del extremo anterior; el poro excretor a 0.215 mm. del extremo anterior y el ano está situado a 0.070 mm. del extremo posterior.

La extremidad caudal está desprovista de ala; existe únicamente una papila preanal bien desarrollada y faltan las postanales; las espículas, iguales, gruesas y no estriadas, miden 0.260 mm. de largo por 0.021 mm. de ancho, al nivel del ano; el gubernaculum falta

Hembra: — Más grande que el macho, mide 30 mm. de largo por 0.665 mm. ó 0.717 mm. de ancho; la primera porción del esófago tiene una longitud de 0.110 mm. a 0.175 mm. y una anchura de 0.070 mm.; la segunda, 1.050 mm. a 1.295 mm. de largo por 0.105 mm. de ancho al nivel de la vulva; el anillo nervioso se encuentra a 0.157 mm. del extremo anterior; la vulva, de labios prominentes, está situada en la parte anterior del cuerpo del animal, al nivel del esófago y a una distancia de 0.770 mm a 0.810 mm. del extremo anterior; el poro excretor está situado a 0.262 mm. del extremo anterior; el ano a 0.110 mm. del extremo posterior.

La vagina es corta; el ovipositor es largo, musculoso y mide de 1.435 mm. a 1.137 mm. de largo por 0.087 mm. a 0.096 mm. de ancho en su tercio anterior; el receptaculum ovorum mide 0.962 mm. de largo por 0.350 mm. de ancho en su porción media; el útero es doble (didelphis) y unas de sus asas pasan hacia el extremo anterior, enlazándose al esófago; el ovario está situado en el extremo posterior; los huevos son ovoides, con una doble cubierta lisa, encierran una larva en el momento de ser expulsados y miden 0.063 mm. de largo por 0.035 mm. de ancho.

HUÉSPED. — *Curucujus massena.*

LOCALIZACIÓN. — Ojos.

DISTRIBUCIÓN GEOGRÁFICA. — Santecomapan, Veracruz. — México.

TIPO: — En la colección de Helmintología del Instituto de Biología, de México.

COTIPOS. — En el Instituto Oswaldo Cruz y en U. S. National Museum, Hel. Coll. N.º 9046.

Discusión. — En el reciente trabajo de Skrjabin acerca del género *Aprocta* están comprendidas, en la clave, sólo siete de las nueve especies de este género y todas ellas difieren de *Aprocta travassosi* n. sp. en el aparato papilar del extremo caudal del macho, en las dimensiones de las espículas y en la estructura del útero.

Por presentar *Aprocta travassosi* un útero bifurcado, podría ser colocada en el nuevo género *Aproctiana* creado recientemente por el mencionado autor ruso, pero por la ausencia de un vestíbulo quitinoso y por la igualdad de las espículas, entra más bien en el género *Aprocta*, en donde la hemos situado definitivamente, ya que el resto de caracteres coinciden con los del género

SUMMARY

In this fifth contribution to the knowledge of the Nematodes of birds from Mexico, we describe again the species *Physaloptera acuticauda* and also two new species: one of genus *Oxyspirura* and the other of genus *Aprocta*.

Our description of *Physaloptera acuticauda* differs very little from that of Ortlepp and Cram: there is a slight difference in the size of males and females and also in the size of the eggs; the structure of the female genital organs is identical with the structure described by Schulz.

We have compared our species of genus *Aprocta* with those described by Skrjabin in his recent work on *Aprocta* and we consider that our specimen has important differences which justify the erection of a new species. These differences are a distinct papillar arrangement of the male caudal end, the size of the spicules and the structure of the uterus.

Because of the presence in our species (*Aprocta travassosi*) of a bifurcated uterus, it could be included in the genus *Aproctiana* originally and recently described by the same russian author; but the absence of chitinoid vestibule, the situation of vulva and conformity of the spicules, are characters which warrant the inclusion of our species in *Aprocta*, where we have definitely placed it.

Oxyspirura crassa n. sp. differs from *Oxyspirura cephaloptera* in number and arrangement of postanal papillae, the absence of cuticula expansions in the anterior end, and in other anatomical details fully described in this work.

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Lámina 1

Physaloptera (Physaloptera) acuticauda

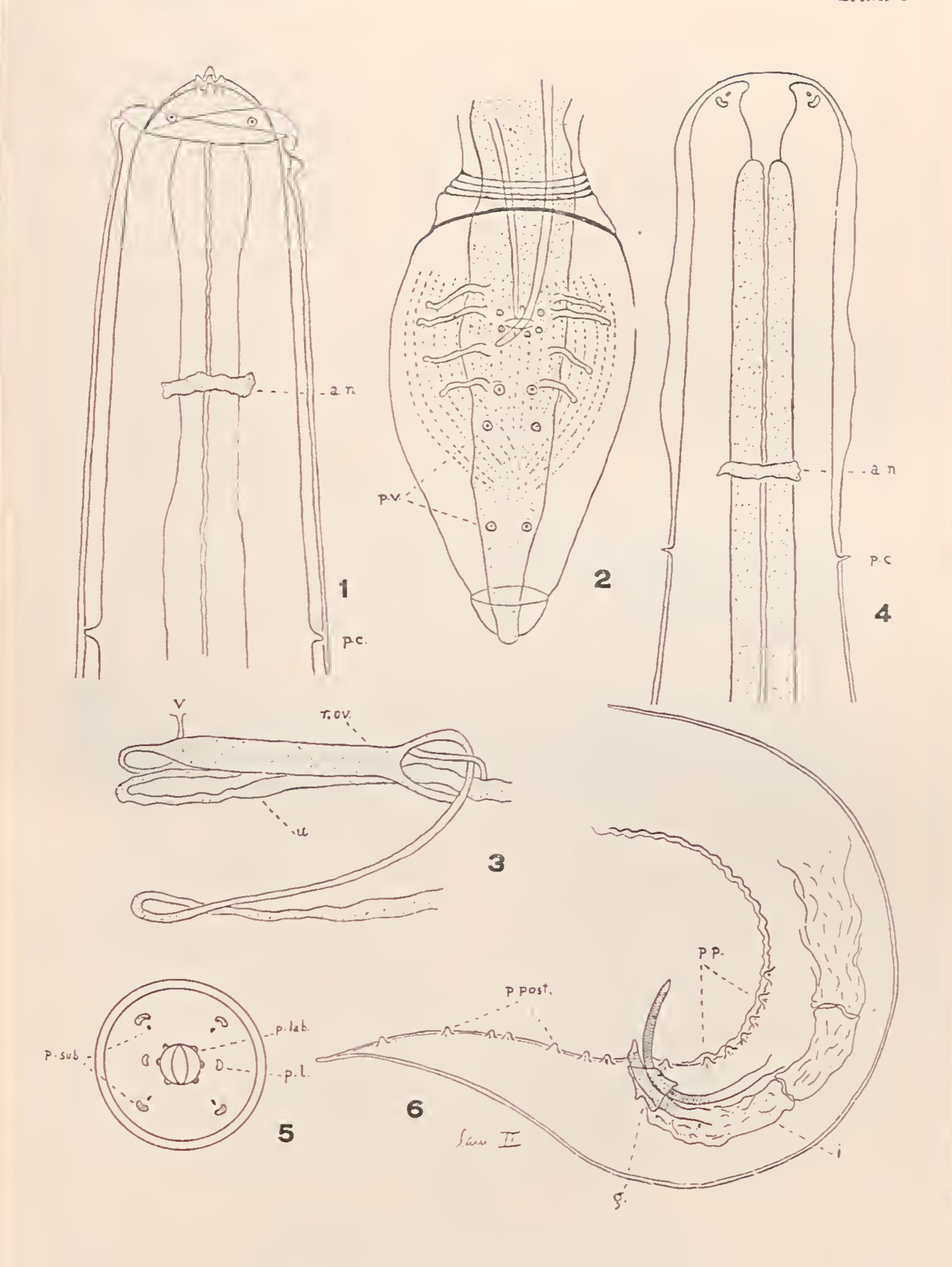
Fig. 1 — Extremidad anterior de la hembra.
Fig. 2 — Extremidad posterior del macho.
Fig. 3 — Terminación del útero.

Oxyspirura crassa n. sp.

Fig. 4 — Extremidad anterior del macho.
Fig. 5 — Vista de frente de la extremidad anterior de la hembra.
Fig. 6 — Extremidad posterior del macho.

Abreviaturas empleadas

a. — ano; a. n. — anillo nervioso; es — espícula. u. — útero; v. — vulva.



Caballero: Nematodos de las aves de México.

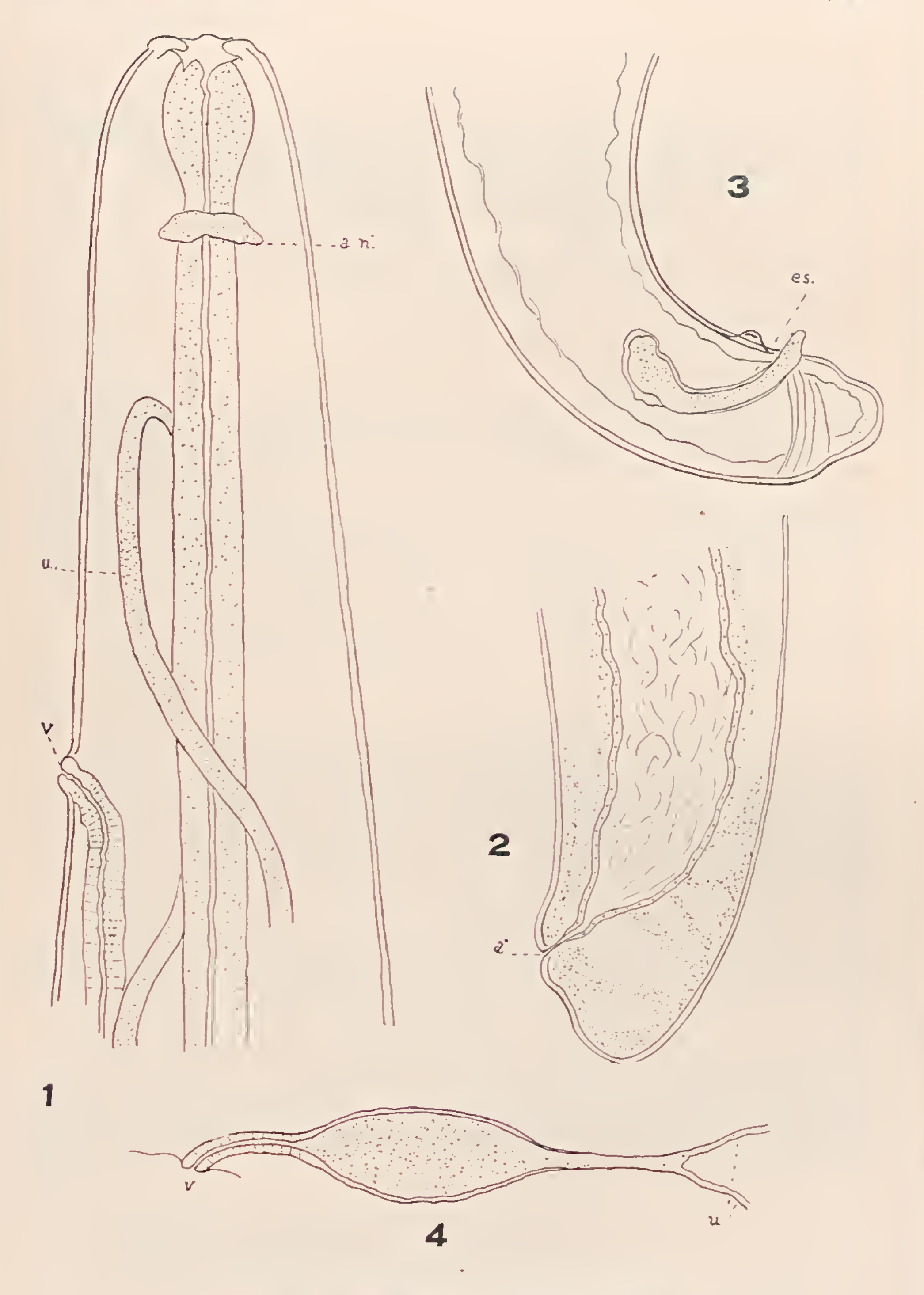
Lámina 2

Aprocta travassosi n. sp.

Fig. 1 — Extremidad anterior de la hembra.
Fig. 2 — Extremidad posterior de la hembra.
Fig. 3 — Extremidad posterior del macho.
Fig. 4 — Terminación del apparato genital femenino.

Abreviaturas empleadas

a. n. — anillo nervioso; g. — gubernaculum; i. — intestino; p. c. — papila cervical; p. lab. — papilas labiales; p. l. — papila lateral; p. p. — papilas preanales; p. post. — papilas postanales; p. sub. — papilas sub-medianas; p. v. — papilas ventrales; r. ov. — receptaculum ovorum; u. — útero; v. — vulva.



Caballero: Nematodos de las aves de México.

Algumas notas sobre Pyrophorus tuberculifer Eschsch. (Col. Elateridae) e descripção de uma nova variedade bahiensis.

Carlos Amadeu Camargo-Andrade
Museu Paulista — Brasil.

(Com 1 estampa)

Recebi, ha tempos, do Dr. Lauro Travassos, 2 *Pyrophorus* de Petropolis, que pela chave de Candeze[1], cahiam na subdivisão do primeiro grupo, ...*leguments soulevés au pourtour*... discordando, porém, em muitos pontos, das diagnose ahi enfeixadas.

A maior divergencia residia no prothorax: estes exemplares apresentavam uma emarginação visivel a olho nú e Candeze não se referindo a essa particularidade deixava duvidas quanto a identidade destes exemplares. Vejamos entretanto com respeito ao prothorax o que diz este autor:

> ...*prothorax subquadrato, inaequaliter punctato, vesiculis suborbibatalis, in tuberculo prominentibus;*...

e logo abaixo:

> ...*Prothorax carré ou à peu près, bombé, inégalement et assez densément ponctué, les vésicules latérales assez petites, arrondies, très-bombées et paraissant d'autant plus saillantes qu'elles sont placé sur un soulèvement des téguments mêmes, soulèvement apparent au moins au côté interne des vésicules, les angles postérieurs un peu divergents assez fortement carénés, le bord postérieur muni d'un tubercule au devant de l'écusson*...

Procurando aclarar a questão, consegui, por intermedio do bom amigo Dr. A. da Costa Lima, copias das diagnoses que me faltavam, reunindo tudo quanto se ventilou sobre esta especie.

A diagnose original de Eschscholtz[2]:

> «*P. tuberculifer vesiculis oblongis in tuberculo sitis, thorace convexiusculo aequali, angulis posticis retrorsum flexis. 13 1/2 lin., Rio Jan.*»;

é, como quasi todas as descripções da epocha, muito superficial, o typo entretanto, com a collecção do Museu de Berlim foi mais tarde redescripto por Germar[3], assim:

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[1] Candeze, M. E. *Monographie des Élaterides, Tome IV, p. 3.*
[2] Eschscholtz, *in Entomologisches Archiv ed. Theodor Thon, 1829, Jena, Bd 2, n. 1, p. 32.*
[3] Germar — *Zeitschr. f. d. Entom. III, p. 16, 5, 1841.*

« *Piceo-niger, fusco-tomentosus, maculis vesicularibus submarginalibus tuberculo insidentibus, elytris distincte punctato-striatis.* Eschsch. Thon Arch., vol. II, fasc. 1, p. 32.

P. tuberculiter. Habitat in Brasilia (Mus. Berol.).

12 Lin. lang, 3 1/2 Lin. breit, braunschwarz, überall dicht und ziemlich fein punktiert, mit niederliegenden, gelblichbraunen Härchen, welche die Grundfarbe bedecken, oben dicht, unten minder dicht bekleidet.

Der Kopf ziemlich gross. Stirn kaum länger als breit, schwach eingedrückt. Die Fühler kürzer als das Halsschild, dunkelbraun. Das Halsschild so lang wie breit, ein Drittheil breiter als der Kopf, gewölbt, *die Seitenränder der ganzen Länge nach etwas verflacht und abgesetzt* [1], gerade, nur an den Vorderecken jäh gerundet und vor den Hinterecken etwas eingezogen, die Hinterecken bilden starke, etwas nach Aussen gerichtete und schwach gekrümmte Dornen. In dem gewölbten Mittelfelde bemerkt man im Vordertheile zwei ziemlich gleich weit von einander und vom Seitenrande entfernte, flache Gruben, in der Mitte eine verloschene eingedrückte Längslinie, und vor den Hinterwinkeln, dem Seitenrande nahe, erhebt sich beiderseits eine kleine Wölbung, unter welcher der blasenförmige Leuchtfleck sich befindet, der eine fast vertikale Stellung dadurch erhält, aber den Seitenrand nicht überragt. Das Schildchen ist länglich eirund, an der Wurzel abgestutzt.

Die Deckschilde sind fast dreimal so lang wie das Halsschild, an der Wurzel kaum merklich breiter wie die Mitte des Halsschildes, gewölbt, an der Wurzel eingedrückt, an den Seiten schon von der Schulter weg bis unter die Mitte allmählich, dann bis zur Spitze stärker verschmälert und an der Naht einen spitzen Winkel bildend, auf der ganzen Oberfläche deutlich gestreift-punktiert ».

Para este autor não passou desapercebida esta particularidade, deixando bem claro: — ...*a margem lateral em todo o seu comprimento um pouco achatada e destacada*...

Pelo exposto não ha mais duvida quanto a identidade da especie e o valor deste caracteristico morphologico que em perto de cincoenta exemplares que consegui ultimamente, é sempre uniforme.

Redescrevendo a especie aproveito a opportunidade para descrever uma nova variedade proveniente da Bahia e muito caracteristica.

Pyrophorus tuberculifer Eschsch.

Pyrophorus tuberculifer Eschsch. *in* Thon, Arch. II, fasc. 1, p. 32, 1829.
Germar, Zeitschr. Ent. III, p. 16, 1841.
Candeze, Mon. IV, p. 17, 1863.
S. Schenkling, *in* Junk, Coleop. Catal, vol. XI, parte 88, p. 351, 1927.

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[1] O grypho é nosso.

Castanho escuro, revestido de pubescencia amarellada, mascarando a côr do tegumento e dando ao todo um tom verde acinzentado.

Macho: — Cabeça grande, olhos salientes. *clypeo* mais longo que largo, fracamente arredondado na frente, bordos lateraes um pouco elevados, formando uma depressão larga no meio, bem accentuada na frente, pontuação densa, grossa e forte.

Antenna castanho-escura, ocracea nos dentes, mais curta que o prothorax, 1.º articulo grande, robusto, 2.º pequeno, 3.º cylindrico de comprimento do seguinte, 4.º ao 10.º dentados em serra e decrescentes, 11.º mais longo e com falso articulo no apice, fracamente pubescentes e pontuados.

Prothorax abaulado, quasi quadrado, pouco mais largo que longo; bordos lateraes parallelos, curvilinearmente estreitados nos angulos anteriores, um pouco contrahidos e elevados junto as bases dos angulos posteriores, percorridos em toda extensão por uma aba comprimida e horizontalmente saliente para fóra; angulos posteriores, longos, delgados, pouco divergentes, fortemente quilhados; as vesiculas phosphorescentes, pequenas, arredondadas, encaixadas em uma pequena elevação do tegumento que lhes dá uma apparencia de salientes, mais approximadas do bordo lateral que do posterior; pontuação desegual pouco mais grossa e cerrada nos lados; face posterior recta com uma protuberancia em frente do escudo; em alguns exemplares ha um vestigio de sulco mediano e em outros de duas fossetas aos lados da linha mediana, no centro.

Escudo oval alongado, base recta, superficie plana, pontuada e pubescente.

Elytros um pouco mais largos que o prothorax, tres vezes mais longos, fracamente deprimidos junto a sutura, na base; parallelos até ao meio estreitando-se então até ao apice onde são conjunctamente arredondados, estriados, mais visiveis para o apice, pontuados em toda extensão; interestrias planas, finamente pontuadas, 3.ª e 5.ª um pouco elevadas na base, limitando a 1.ª na frente, que é deprimida; angulos basaes arredondados.

Patas e parte inferior com côr e pubescencia da superior.

Femea: — Prothorax um pouco mais largo no centro, vesiculas maiores, antennas mais robustas.

Comprimento: — 28 mm. Largura: 7 mm.

LOCALIDADE TYPICA: — Rio de Janeiro.

O Museu Paulista possue diversos exemplares desta especie provenientes de: São Paulo: (Capital, Porto Epitacio, Juquiá, Franca); Minas Geraes: (Marianna); Estado do Rio: (Petropolis).

Pyrophorus tuberculifer bahiensis n. var.

Esta raça distingue-se perfeitamente pelo porte mais robusto, maior, proporcionalmente muito mais largo; os machos teem os bordos lateraes do prothorax, sensivelmente curvilineos, os angulos posteriores mais robustos e menos divergentes; a pontuação do prothorax é mais uniforme. A pubescencia de um amarello mais vivo; as femeas teem o prothorax um pouco mais largo para frente e proximo ao angulo anterior estreita-se rapidamente em curva.

Comprimento: — 31 mm. Largura: — 9 mm.

LOCALIDADE TYPICA: — Jequié. Estado da Bahia.

O Museu possue tres exemplares, 2 machos e uma femea, todos provenientes de Jequié e colleccionados pelo autor em Dezembro de 1932.

Estampa 1

Fig. 1 — *Pyrophorus tuberculifer* Eschsch., macho.
Fig. 2 — *Pyrophorus tuberculifer* Eschsch., femea.
Fig. 3 — *Pyrophorus tuberculifer* var. *bahiensis* n. var. macho.
Fig. 4 — *Pyrophorus tuberculifer* var. *bahiensis* n. var. femea.

Photos do Autor.



Camargo-Andrade: Notas sobre *Pyrophorus tuberculifer*.

On the Morphology and Parasitic Development of Travassosius rufus Khalil, 1922, a Trichostrongyle parasite of the Canadian Beaver (Castor canadensis canadensis)

Thomas W. M. Cameron
Professor of Parasitology, McGill University; Director, Institute of Parasitology, Macdonald College, P. Q. Canada.

[With 1 plate]

The Beaver, *Castor canadensis canadensis*, is one of the most important of all the Canadian mammals. The search for its pelts probably did more than anything else to stimulate the expansion of the Hudson's Bay Company, and the expansion of the Company was a vital factor in the early development of the country. Unfortunately, however, the beaver was over-hunted and it is now to a very considerable extent under protection. This may, in part at least, account for the lack of knowledge of the internal parasites of this animal. In the days when material was plenty, there was little research on this subject and Morgan (1868) summarizes practically all that was known. With the growth of modern helminthology, came the protection of the beaver and material became much more scarce; many of Morgan's species have not been seen in recent times, although several new forms have been described.

Recently, the Institute of Parasitology received the carcasses of two beavers from Anticosti, P. Q., a large island situated in the lower St. Lawrence River. These contained *Cladorchis subtriquetus* in their caeca and nematodes in their stomachs. These nematodes belonged to the genus *Travassosius*, a genus of Trichostrongyles created by Khalil in 1922 for a nematode from the Norwegian beaver *(Castor fiber)* and named in honour of Dr. Lauro Travassos.

The average length of the males is about 11 mm. (11.5 mm. to 10 mm.) while the female is slightly longer — about 12 mm. (15 mm. to 10.5 mm.). The colour, when preserved in formalin, is brown: when alive, it is probably similar to that observed by Khalil.

The cuticle is both transversely and longitudinally striated. The longitudinal striations consist of about 30 main and a very large number of fine subsidiary lines. The transverse striations are most obvious at the tail and least obvious at the head end in both sexes. They are very fine, and cutting across the fine longitudinal striations, give these the appearance of a series of dots.

The lateral bands are broad and conspicuous and are visible from the neck to the anal or cloacal region.

The excretory pore, which is directed in a posterior direction, is situat-

ed about the level of the mid-point of the oesophagus, and just behind the nerve ring. The cervical papillae are large, pointed and directed backwards, and lie on the lateral lines, almost mid-way between the excretory pore and the posterior end of the oesophagus.

Prebursal papillae are present in the male and although not so large as depicted by Khalil, are obvious. There are no caudal papillae in the female, but towards the tip of the tail (dividing it in the ratio of 3 : 1) are two minute sensory pits.

The digestive system. — The mouth is a small central pore surrounded by six small circum-oral papillae on three very small lips. It communicates with a small but well-defined mouth cavity, the anterior edge of which is surrounded by a hyaline cuticle, the posterior margin being in contact with the oesophagus. No teeth could be seen.

The oesophagus is similar in size and appearance in both sexes. It is about 0.65 mm. long, and has a maximum width of about 0.075 mm. It is divided into three regions; a very small hyaline anterior portion at the base of the mouth cavity, a long muscular central portion and the swollen club-like posterior portion which is mainly glandular.

The intestine is a simple, straight tube.

The male. — The testis originates at about the junction of the anterior and second sixth and pursues an almost straight course. It gradually widens to become a very elongated but single seminal vesicle; no special dilations, as described by Khalil, could be seen. It terminates in a broad, flat genital cone on which are two small papillae.

The oblique, ventro-lateral muscles are well developed.

The bursa is comparatively large, with its lateral margins folded ventrally. Its edge is finely scalloped. There is a minute dorsal lobe and two very large lateral lobes. The rays (Fig. 1) are quite symmetrical.

The ventro-ventral ray is very small and curves in an anterior direction; it is widely separated from the latero-ventral. The latero-ventral and all three lateral rays are massive and lie parallel with each other, directed laterally. Each terminates in a finger-like constriction. All three lateral rays are slightly larger than the latero-dorsal and all diverge at their free ends.

The externo-dorsal and the termino-dorsal rays are all directed posteriorly. The externo-dorsals are relatively narrow, incurved, and, rising from the base of the dorsal complex, terminate a short distance from the edge of the bursa; they are the only rays which do not reach the margin. The dorsal ray is fairly thin and Y-shaped, each arm ending in three minute digitations, somewhat irregularly arranged.

The spicules are equal and similar, measuring 0.15 mm. long. Each consists of a lightly cuticularized cylinder, which is split on one side — generally the latero-ventral — for its distal half. Each half of the cylinder is reinforced by a heavy cuticularized, brown-coloured spatulate plate; in side view, this appears as one or two narrow rods. The free end of the spicule is not quite reached by this plate, and accordingly is ligthly cuticularized. These plates are joined to the heavily cuticularized cup-like proximal end, to which is attached the massive retractor muscles.

The female. — The vulva is situated about the junction of the posterior and third quarter of the body, on the mid-ventral line. It, and the short

cuticularized vagina, are conspicuous structures. The vagina leads directly into the opposed ovejectors, the terminal common voluminous portion of which usually holds about seven eggs. At the end of this portion (Fig. 2) is a stout sphincter muscle, and beyond this is a narrow muscular *pars ejectrix*. This communicates directly with the uterus, each of which contains 25 to 35 eggs, each egg lying as a rule, in a transverse direction in a single row. The junction between uterus and ovary is abrupt (Fig. 3). A muscular, pyriform body, has its apex attached to the uterus. At its base, it communicates with an oval thick-walled chamber, which in turn communicates with the ovarian tubule. The function of the latter part of this apparatus appears to be the shaping of the egg, and perhaps the formation of the shell. Each part, usually contains a single ovum.

The inferior ovarian tubule extends posteriorly to a short distance in front of the tail. This portion is very short and is almost immediately directed anteriorly, to pass the ovejector and originates about the anterior end of the superior uterus. The superior ovarian tubule is almost straight and originates about a third of the body length from the head. The eggs measure 80-90 micra by 45 micra wide.

The female tail is about 0.35 mm. long and ends bluntly. The tip is generally slightly curved dorsally (Fig. 4). The rectum is divided into two parts of about equal size. The portion which communicates with the transverse anus, is a cuticularized tube, with a thicker postero-dorsal portion. The anterior section is granular, not cuticularized and more voluminous.

Discussion. — The type species was named *T. rufus* by Khalil. In 1925 Chapin very briefly described a second species, *T. americanus*, from the American beaver *(Castor canadensis)* which he differentiated from the type species mainly on the somewhat smaller size and somewhat different shape of the spicules, and in the shape of the dorsal ray. The spicules in Chapin's species measure 148 micra to 152 micra long but the differencies in shape are not mentioned and no drawings were published. Khalil's species has spicules 185 micra long.

Chapin describes the dorsal ray as having a main stem 56 micra long and two branches each 16 micra; the branches are not bifurcated at the tip. Khalil, on the other hand, gives the total length of this ray as 90 micra, with branches 30 micra long, each ending in two digitations.

In the present specimens the spicules are 150 micra long, but approximate quite closely to Khalil's description. Their appearance varies greatly however when examined from different points of view. The overall length of the dorsal ray is about 75 micra with arms 30 micra long: each branch ends in three minute digitations, which are very difficult to observe.

Both Chapins's specimens and my own are slightly shorter than Khalil's, but in the dimensions of the oesophagus and the female tail, my specimens approach Khalil's.

None of the differences seem to be of sufficient significance to justify the existence of two species and I regard both Chapin's species and the present specimens as belonging to *Travassosius rufus* Khalil, 1922.

Fourth stage larva. — A number of fourth stage larvae, in varying stages of development, were found in the stomach of one of the beavers. The youngest (Fig. 5) was a male, 2.65 mm. long and 0.05 mm. in maximum thickness. The

cuticle is finely striated transversely and papillae are absent. The head end is similar to but smaller than the adult. The oesophagus is club-shaped and measures 0.32 mm. in length. The intestine is a simple tube. The tail end is abruptly pointed and within may be seen the earliest stages in the formation of the genitalia. Sacs representing the spicules, the genital tube and the rectum are visible. Through the latter runs a minute tube joining the larval anus to the intestine.

A later stage (Fig. 6) male shows the formation of the bursa, although the rays are not yet distinguishable. The spicules are now formed, although not completely so, and the genital tube is recognizable.

In the very young adult (Fig 7) the rays are clearly seen, although they are very small, and in this species, as in others studied at this stage, the dorsal ray is seen to be composed of *two* rays fused through part of their length to form the main dorsal stem. The spicules are now approaching their adult form and measure 0.13 mm. in length. Their development is consederably in advance of the other genital organs.

No female larvae, corresponding to the youngest male larva, were recovered. One female however corresponding to the second male larva described, was seen (Figs. 8 and 9). The ovejector is considerably developed, the uteri, though small, show traces of their lumina and young ovarian tubules are in process of growth from their distal ends. The adult rectum is also in process of formation, although a larval rectal tube runs through it. The tail is much more pointed than in the case of the male.

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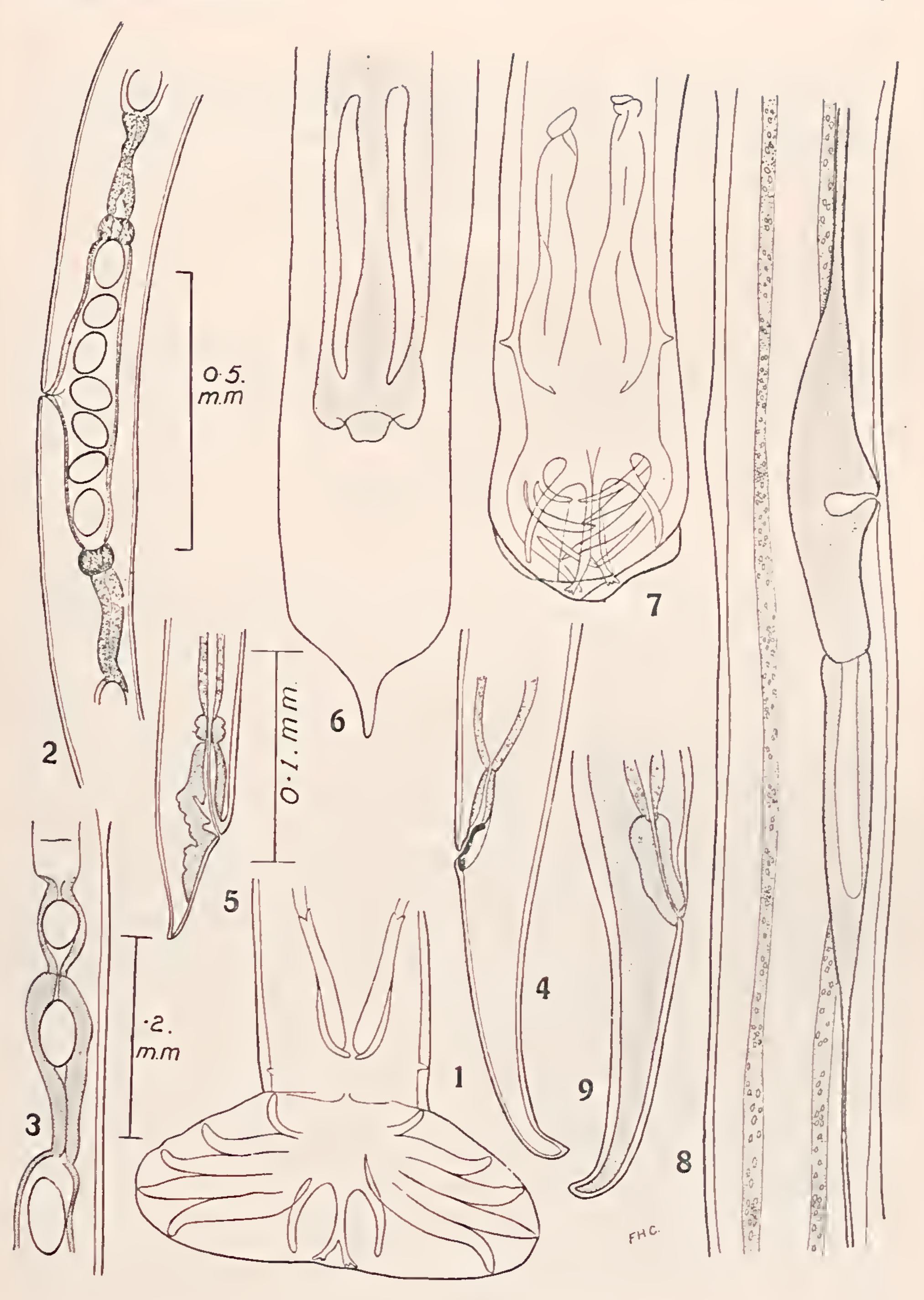
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Plate 1

Fig. 1 — *Travassosius rüfus*. Bursa of male.
Fig. 2 — *Travassosius rufus*. Ovejectors of female.
Fig. 3 — *Travassosius rufus*. Junction between uterus and ovarian tubule.
Fig. 4 — *Travassosius rufus*. Tail of female.
Fig. 5 — *Travassosius rufus*. Tail of male fourth-stage larva.
Fig. 6 — *Travassosius rufus*. Tail of older male fourth-stage larva.
Fig. 7 — *Travassosius rufus*. Tail of very young adult male.
Fig. 8 — *Travassosius rufus*. Vulvar region in older female fourth-stage larva.
Fig. 9 — *Travassosius rufus*. Tail of same larva.



Cameron : *Travassosius rufus* Khalil, 1922.

A Report on the Parasites of a bat, Nycticeius humeralis, with descriptions of four new helminths.

Asa C. Chandler

Biological Laboratory, Rice Institute, Houston, Texas — U. S. A.

[With 2 plates]

Eight specimens of Rafinesque's bat, *Nycticeius humeralis*, collected from an attic on the outskirts of Houston, Texas, were examined for parasites. No external parasites were found except *Cimex pilosellus*. Two new species of nematodes were found, and three species of flukes, one of which is new.

Capillaria palmata n. sp.

(Plate 1, figs. 1-4).

Diagnosis. — Very slender transparent worms. Mouth small, without papillae. Cuticle with extremely fine transverse striations in about second fourth of body, but striae only visible under high magnification. Dorsal and ventral bacillary bands present, and provided with rather large and scattered cuticular plaques, which appear as single lines of coarse widely separated tubercles (10 to 18 microns apart) just behind the head, increasing to about 4 irregular rows of conspicuous mushroom-shaped tubercles in the posterior esophageal region, and then becoming smaller and more numerous in the middle and posterior region of the body. Cuticle with fine longitudinal striations between bacillary bands.

Female 21 to 22 mm. long. The body tapers from the very fine head, only about 8 to 10 microns in diameter, to a maximum diameter of 110 to 120 microns in the posterior third of the body. Near the caudal end the body tapers again, and has a bluntly rounded termination with a slight furrow in it, like a cleft chin. The body is about 50 microns broad just anterior to the subterminal anus. The esophagus is 6.7 to 6.9 mm. long, its termination dividing the body about 1 : 2.2. The vulva is situated about 50 microns behind the end of the esophagus. It opens on a penis-like prominence which is about 65 to 90 microns long and 22 to 25 microns in diameter. The vulva opens into a vagina or ovejector which has a very narrow lumen and a very thick muscular wall. Through this the embryonated eggs pass in single file. About 40 to 50 microns posterior to the vulva the wall thins and the lumen gradually enlarges. Eggs 47 to 50 microns by 31-32 microns, embryonated.

Male 10 to 12 mm. long, tapering from the fine head, 8 microns in diameter, to a maximum diameter of 50 to 60 microns, which is maintained for the greater part of its length. Esophagus 3.7 to 4.4 mm. long, dividing the body about 1 : 1.7 to 1 : 1.8. Spicule 1.05 to 1.2 mm. long and about 5 to 6 microns in diameter. Sheath about 20 microns broad, without spines, but with conspicuous transverse striations or wrinkles except towards its distal end;

where it is provided with fine striations. Caudal end of body provided with a pair of lateral alae about 75 to 80 microns long and about 8 microns in diameter, and with a well developed bursa, open ventrally, about 30 microns long and 30 microns broad. Dorsally body forks into two blunt finger-like lobes which extend to about half the length of the bursa. From the tips of these lobes a process extends to the tip of the bursa on either side dorsally. Another process extends transversely across the dorsal side of the bursa from the tip of one lobe to the tip of the other. A group of associated processes, suggesting a group of poorly developed lateral rays in a Strongylid, springs from the latero-ventral margin of each dorsal lobe and supports each side of the bursa (see Figs. 1 and 2).

HABITAT: — Intestine of a bat, *Nycliceius humeralis*, taken at Houston, Texas.

TYPE SPECIMENS: — Deposited in U. S. National Museum.

This nematode was found in two of the eight bats examined. This appear to be the first record of a *Capillaria* in North American bats, although five species have been described from Brazil (see Freitas & Lent, 1936) and three from Europe, although only one of the European forms, *C. speciosa*, has been adequately described. *C. palmata* resembles *C. speciosa* more closely than it does any of the Brazilian species, but differs in the position of the vulva, length of the spicule, form of bursa, size of eggs, and other minor features.

Allintoshius travassosi n. sp.

(Plate 1. figs. 5-6, Plate 2, figs. 1-2).

Diagnosis. — Very small, nearly transparent worms. Cuticle with very fine transverse striations only visible under high magnification, and with about 8 well-developed longitudinal ridges. Cephalic cuticular inflation about 70 microns long and somewhat asymmetrical, being more expanded dorsally. Diameter of head exclusive of inflated cuticle about 20 microns, with inflation about 40 microns. Esophagus club-shaped, about 300 microns long. Nerve ring about 200 microns from anterior end; excretory pore not seen.

Female about 8 to 10 mm. long with a maximum diameter, just anterior to vulva, of about 125 to 140 microns, diminishing to about 20 microns less immediately behind the vulva. Vulva 1.05 to 1.25 mm. from posterior end, a transverse slit, with a barely projecting anterior and posterior lip, but bordered on one side, occasionally on both, by a conspicuous fin-like expansion of the cuticle varying in shape and size in different individuals; it has a maximum height of about 70 microns and varies in length from about 145 to 290 microns. Vagina only about 20 microns long, perpendicular to body wall, and opening into divergent ovejectors each about 120 to 160 microns long. Ovejectors have wide oval chambers in the middle of their length and terminate in round bulbs with thick muscular walls just before joining the uteri from which they are separated by valves. Anus about 125 to 150 microns from tip of tail. Tail bluntly rounded near end, terminating in a single spine-like process about

15 to 17 microns long. Diameter of tail just anterior to terminal spine about 15 microns. Eggs in uterus measures about 72 by 40 microns.

Male 3.5 to 4.5 mm. long, with a maximum diameter of about 82 microns; diameter just anterior to bursa about 67 microns. Bursa large, the lateral lobes about 110 microns long and the same in width. Dorsal lobe about 75 microns long and 40 microns broad, without a deep incision where it joins the lateral lobes. Dorsal ray single, about 75 microns long, ending in four small prongs formed by a terminal bifurcation and two short subterminal branches. Externo-dorsal long, arising from the root of the dorsal and spreading in a broad arc to terminate at the margin of the bursa just lateral to the junction of dorsal and lateral lobes. Postero-lateral ray curves away from other lateral rays to become contiguous with the more slender externo-dorsal ray for the greater part of its length. Medio-lateral and externo-lateral rays very long (130 microns), perfectly straight, of uniform thickness, and contiguous for their entire length; they terminate at the farthest extremities of the lateral lobes. Ventral rays divergent, both curving ventrally, the latero-ventral longer and slenderer than the ventro-ventral. Spicules 70 to 75 microns long, shaped like cornucopias, sharply pointed distally, without lateral flanges, and about 12 to 14 microns in diameter at the open proximal ends. Gubernaculum about 25 microns long.

HABITAT: — Intestine of a bat, *Nycticeius humeralis*, taken at Houston, Texas.

TYPE SPECIMENS: — Deposited in U. S. National Museum.

The species is named for Dr. Lauro Travassos, who has done such extensive work on the family *Trichostrongylidae*.

This nematode was found in four of the eight bats examined. It differs from *A. nycticeius* described by Chitwood from the same host in its much larger size with relatively shorter esophagus, smaller spicules, divergent ventral rays, contiguity of tips of externo-lateral and medio-lateral rays, more posterior position of vulva, absence of mucrones at base of caudal spike, and shorter and broader eggs.

The genus *Allintoshius* was erected by Chitwood (1937) to include a species, *A. nycticeius*, found in *Nycticeius humeralis*. Since Chitwood's description is very brief and omits reference to certain characters of generic value, an emended generic description follows: —

Allintoshius Chitwood, 1937.

GENERIC DIAGNOSIS, EMENDED

Trichostrongylidae. Small slender worms, uncolored, cuticle with very fine, almost invisible, transverse striations and about 8 longitudinal ridges. Cephalic extremity with cuticle dilated, but with no transverse furrow. Mouth simple, without spines but with an inner circle of minute papillae. No cervical or prebursal papillae seen. Vulva in posterior part of body, without prominent lips. Vagina very short, perpendicular to body wall, opening into divergent ovejectors. Cuticle expanded into a conspicuous fin-like process on one both sides of vulva. Tail of female ending in a single spine-like process with or without

a pair of minute mucrones at the base. Bursa large, composed of two large lateral lobes and an inconspicuously set-off dorsal lobe, without spines on the membranes. Dorsal ray single, bifurcated at tip, and with two small subterminal branches, thus ending in four prongs. Externo-dorsals, arising from root of dorsal, large, reaching margin of bursa and closely associated distally with the postero-lateral rays. The three lateral rays arise from a common trunk; the medio-lateral and externo-lateral are very long and straight, extending to the farthest extremity of the long lateral lobes, and contiguous for all or most of their length. Postero-lateral rays diverge, curving dorsally to come in contact with the externo-dorsals. Ventral rays arise from a common base, divergent, strongly curved ventrally. Spicules short, separate, cornucopia-shaped, ending in fine points and without lateral flanges. Gubernaculum present.

Chitwood assigned this genus to the subfamily *Ollulaninae*, but this allocation cannot be justified since the genus *Ollulanus* is characterized by having a single uterus and ovary, and therefore belongs with the *Heligmosomidae*.

The other genera of *Trichostrongylidae* which have so far been described from bats fall into two groups. One, including *Histiostrongylus* Molin, 1861 and *Spinostrongylus* Travassos, 1935 is characterized by a circle of large cuticular spines on the posterior margin of a collar-like cephalic cuticular inflation, and in the case of *Spinostrongylus* by rows of small spines on the cervical region behind the collar. These have recently been placed by Travassos (1935) in a new subfamily, *Spinostrongylinae*. The other group includes *Anoplostrongylus* Boulenger, 1926, *Nycteridostrongylus* Baylis, 1930, *Molinostrongylus* Skarbilovitch, 1931, *Torrestrongylus* Vigueras, 1935, *Tricholeiperia* Travassos, 1935, and, according to Travassos, *Strongylacantha* Beneden, 1873. The last was placed in a separate subfamily *Strongylacanthinae*, in the family *Ancylostomidae*, by Yorke & Maplestone (1926). Seurat (1920) placed *Strongylacantha* in the *Trichostrongylidae* and Travassos (l. c.) follows him. On the basis of the possession of three cuticular spines surrounding the small terminal spike at the end of the tail of the female, Travassos places all of this second group of bat trichostrongyles, together with *Bradypostrongylus* Price, 1928, from a sloth into the subfamily *Strongylacanthinae*. In the writer's opinion, *Strongylacantha* is so widely different from the other genera which Travassos associated with it as to warrant its retention in a separate subfamily of its own. The rest of the genera seem to form a natural group of fairly closely related forms for which the subfamily name *Anoplostrongylinae* is proposed. This subfamily may be defined as follows:

Trichostrongylidae. Small, slender; cuticle with fine striations, and with a cephalic inflation; no distinct buccal capsule; mouth unarmed; vulva behind middle of body, divergent muscular ovejectors present; tail of female ending in a slender spike surrounded by three cuticular spine-like processes. Male with slender alate spicules; gubernaculum present or absent; bursa large, the dorsal lobe small. Type genus, *Anoplostrongylus* Boulenger, 1926.

The genus *Allintoshius* here described is excluded from the *Anoplostrongylinae* by the absence of spines at the end of the tail of the female, and by the form of the spicules. It should be retained in the subfamily *Trichostrongylinae*. It differs from any other genus in the family by the association of the externo-dorsal and postero-lateral rays, and by the peculiar form of the medio-lateral and externo-lateral rays, as well as by the form of the spicules.

Urotrema shillingeri (=lasiurensis)

Two specimens of *Nycticeius humeralis* out of eight examined each contained a single individual fluke which I assign to this species. The two specimens differ considerably from each other. One specimen (Plate 11, fig. 1) is obviously young and fully relaxed. It is about seven times as long as wide (3.3 by 0.175 mm.), has a long space between the suckers, no apparent prepharynx, an ovary smaller than the acetabulum, the testes well separated, and the vitellaria extending from the ovary to a point about three-fourths the distance from ovary to anterior testis. The other specimen is fully mature and less completely relaxed. It is about five times as long as wide (5.1 by 1.05 mm.), has a much shorter distance between the suckers, has a distinct but short prepharynx, an ovary larger than the acetabulum, the testes contiguous, and the vitellaria extending from just behind the acetabulum to a point two-thirds the distance from ovary to anterior testis. In the large specimen the acetabulum lies directly in the fork of the intestine, while in the small one it lies 200 microns behind it.

These differences indicate that there are very marked variations within a species with respect to size and position of organs, depending on age and on degree of relaxation of specimens. Since these characters have been utilized to a large extent in differentiating the species in this genus, it seems desirable to look more carefully into the bases for separating these species.

The type species of the genus, *U. scabridum*, was described by Braun (1900 a, 1900 b) from a species of *Molossus* in Brazil. Price (1931) described *U. shillingeri* from a single specimen taken from a muskrat in Maryland; he considered this to be in all probability and accidental or abnormal host record *Urotrema lasiurensis* was named and described by Alicata (1932) from three specimens collected from a red bat, *Lasiurus borealis*, at Washington, D. C. Some specimens collected by Price from an unidentified bat in Texas (Price 1931), and also some others from *Nycticeius humeralis* in Maryland, were examined by Alicata and found to be identical with his new species. Later Macy (1933) reported the same species from *Eptesicus fuscus* in Minnesota, and described another new species, *U. minutum*, from *Lasionycteris noctivagans* in Minnesota.

U. shillingeri was differentiated from the type species, *U. scabridum*, on the basis of body size, relative size of suckers, distribution of vitellaria, distance between testes and size of eggs. The body size is probably of no significance; the sparseness of the eggs in the single specimen found by Price suggests a young fluke, or one which had been dwarfed by development in an accidental host. The acetabulum in both *scabridum* and *shillingeri* is larger than the oral sucker, but in *shillingeri* both suckers are only about half as large as in *scabridum*. The distribution of the vitellaria can be given very little weight in view of the variation shown by my specimens from *Nycticeius humeralis* in Texas, which otherwise closely resemble *lasiurensis*. In the specimens referred to as *U. lasiurensis* by both Alicata and Macy the vitellaria extend posteriorly to the level of the anterior border of the anterior testis, but their figures show clearly that the specimens were somewhat contracted. In living specimens it was observed that the relative position of the vitellaria varied considerably as the body was extended and contracted. In *U. shillingeri* the vitellaria are situated further forward than in either *scabridum* or *lasiurensis*, but it is not unlikely that this is due to incomplete

development in a posterior direction. The spacing of the testes would appear to be of no significance, since in one of my specimens the testes are contiguous while in the other they are 180 microns apart. In Shillinger's specimen the distance is 120 microns. The distance between oral and ventral suckers is not strikingly different in view of the difference in size of the body. The only distinct difference between *scabridum* and *shillingeri*, therefore, would appear to be the size of the suckers and size of the eggs. The latter is given by Braun as 18 by 9 microns for *scabridum*, whereas Price gives 22 by 15 microns as the size of the eggs of *shillingeri*. The possibility of a shrinkage due to fixation or preservation in Braun's specimens should be considered, since in all other described forms of the genus the eggs are uniformly 21 to 26 microns long and 11 to 13 microns in diameter.

U. lasiurensis was stated by Alicata to occupy a position intermediate between *scabridum* and *shillingeri*. It was differentiated from the former by the extent of the vitellaria, by the smaller distance between the suckers, by the larger size of the ovary relative to the acetabulum, and by the smaller size of the suckers. It was differentiated from *shillingeri* on the basis of the body size and extent of the vitellaria. As already shown, neither of these characters constitutes a valid distinction. Another point of difference between Price's description of *shillingeri* and Alicata's of *lasiurensis* is the presence of a short prepharynx in the former and its absence in the latter. In one of my specimens, however, a very short prepharynx is present and evidence of its ability to elongate is shown by the fact that the prepharyngeal lumen extends a short distance down over the pharynx like a cap.

In the light of the additional data supplied by my specimens there is no good reason for considering *lasiurensis* as specifically distinct from *shillingeri*, and the name *lasiurensis* therefore becomes a synonym of *shillingeri*. The differentiation of this North American form from the South American *scabridum* rests only on the much smaller actual and relative size of the suckers and of the pharynx, on the much smaller distance between the fork of the esophagus and the ventral sucker, and the larger size of the eggs. Unless collection of additional material should show intergradations or suggest errors in measurement, these distinctions appear to warrant the specific separation of *shillingeri* from *scabridum*.

U. minutum Macy (1933) was differentiated by its small size, relatively larger suckers, longer and more delicate esophagus, relatively larger ovary, testes and cirrus pouch, presence of a seminal receptacle, different position of cirrus pouch, and shorter ceca. Macy apparently describes only a single specimen, and does not say whether others were found. The presence of a seminal receptacle is the only one of these characters which is really distinctive, all the others being possibly due to a strongly contracted condition of a young specimen. For the present, however, it seems desirable to retain this species as a separate one.

Dicrocoelium rileyi

This species was described by Macy (1931) from the gall bladder and bile ducts of *Tadarida cynocephala* in Northwestern Oklahoma. The gall bladders of only six of the eight bats collected by me were examined, and only

one of these contained this fluke. My specimens are somewhat smaller than Macy's, fully extended specimens having a length of from 2 to 2.7 mm. but with a diameter of only 360 to 580 microns. The specimens agree in all other respects except the size of the eggs which in my specimens measure 39 to 41 microns by 19 microns, whereas Macy gives the measurements as 35.6 by 19 microns. This constitutes a new host record for this fluke.

Limatulum diminutum n. sp.

(Plate 2, fig. 3).

Diagnosis. — A small, nearly spherical fluke, about 325 to 590 microns in length by 205 to 515 microns in width, the average body diameter (average of width and length) being 280 to 535 microns. Cuticle without spines. Oral sucker subterminal, from 90 to 150 microns broad and from 67 to 95 microns long, the average diameter (average of width and length) being 78 to 110 microns. Acetabulum situated about two-fifths of body length from anterior end, measuring about 50 to 70 microns in diameter and being, therefore, from one-half to two-thirds size of oral sucker. No prepharynx; pharynx about 25 to 30 microns long and 10 microns broad; esophagus short; ceca spreading wide apart, at about right angles to long axis of body, pretesticular. Testes rather variable in size, usually nearly round, slightly anterior to or at level of acetabulum, about 65 to 90 microns in diameter. Ovary oval, broader than long, about 75 by 110 microns, situated between acetabulum and fork of esophagus in midventral line towards dorsal side, overlaid ventrally by the large and much convoluted seminal vesicle. Genital atrium with thick muscular wall, partially overlapping ventral sucker on right side. Seminal receptacle immediately behind acetabulum, transverse in position, about 60 microns long and half as broad. Vitellaria composed of large elongated follicles, situated lateral to pharynx and oral sucker and anterior to sex glands. Uterus mostly in transverse slings, occupying most of body posterior to acetabulum and testes. Eggs yellowish brown, 22 to 24 microns long and 12 to 13 microns broad.

HABITAT: — Intestine of a bat, *Nycticeius humeralis*, taken at Houston, Texas.

TYPE SPECIMEN: — Deposited in U. S. National Museum.

This fluke was found in five of the eight bats examined.

Three other species of *Limatulum* have been described. The type species, *L. limatulum* Braun, 1900, has a spiny cuticle, and is about 1 mm. long with suckers no larger than those of the species here described. *L. oklamomensis* Macy, 1931, (late spelled *oklahomensis*) is also about 1 mm. long, with nonspined cuticle, and larger suckers than in *L. limatulum*. *L. gastroides* Macy, 1935, is smaller, with relatively smaller suckers than either of the other species. *L. limatulum* and *L. oklamomensis* have the acetabulum equal to or larger than the oral sucker. *L. gastroides* has the ventral sucker slightly but definitely smaller. *L. diminutum* differs from *limatulum* in its unspined cuticle and from all the other species in having the acetabulum much smaller than the oral sucker, in the position of the seminal vesicle directly ventral to the ovary, and in the more anterior position of the testes relative to the acetabulum.

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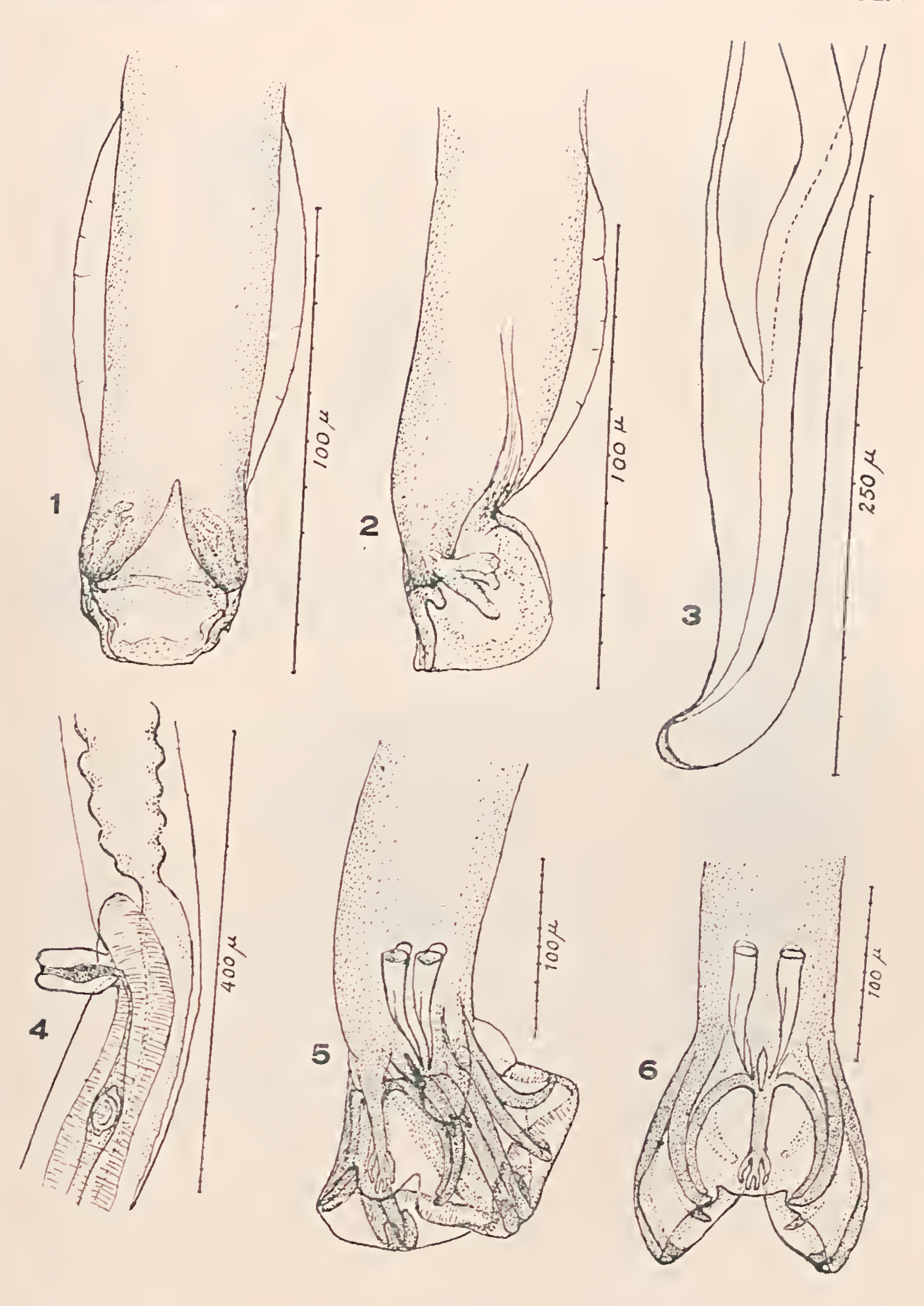
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Plate 1

Fig. 1 — *Capillaria palmata*. Ventral view of caudal end of male.
Fig. 2 — *Capillaria palmata*. Lateral view of caudal end of male.
Fig. 3 — *Capillaria palmata*. Lateral view of caudal end of female.
Fig. 4 — *Capillaria palmata*. Vulval region.
Fig. 5 — *Allintoshius travassosi*. Lateral view of caudal end of male.
Fig. 6 — *Allintoshius travassosi*. Dorsal view of caudal end of male.



Chandler: Parasites of *Nycticeius humeralis.*

Plate 2

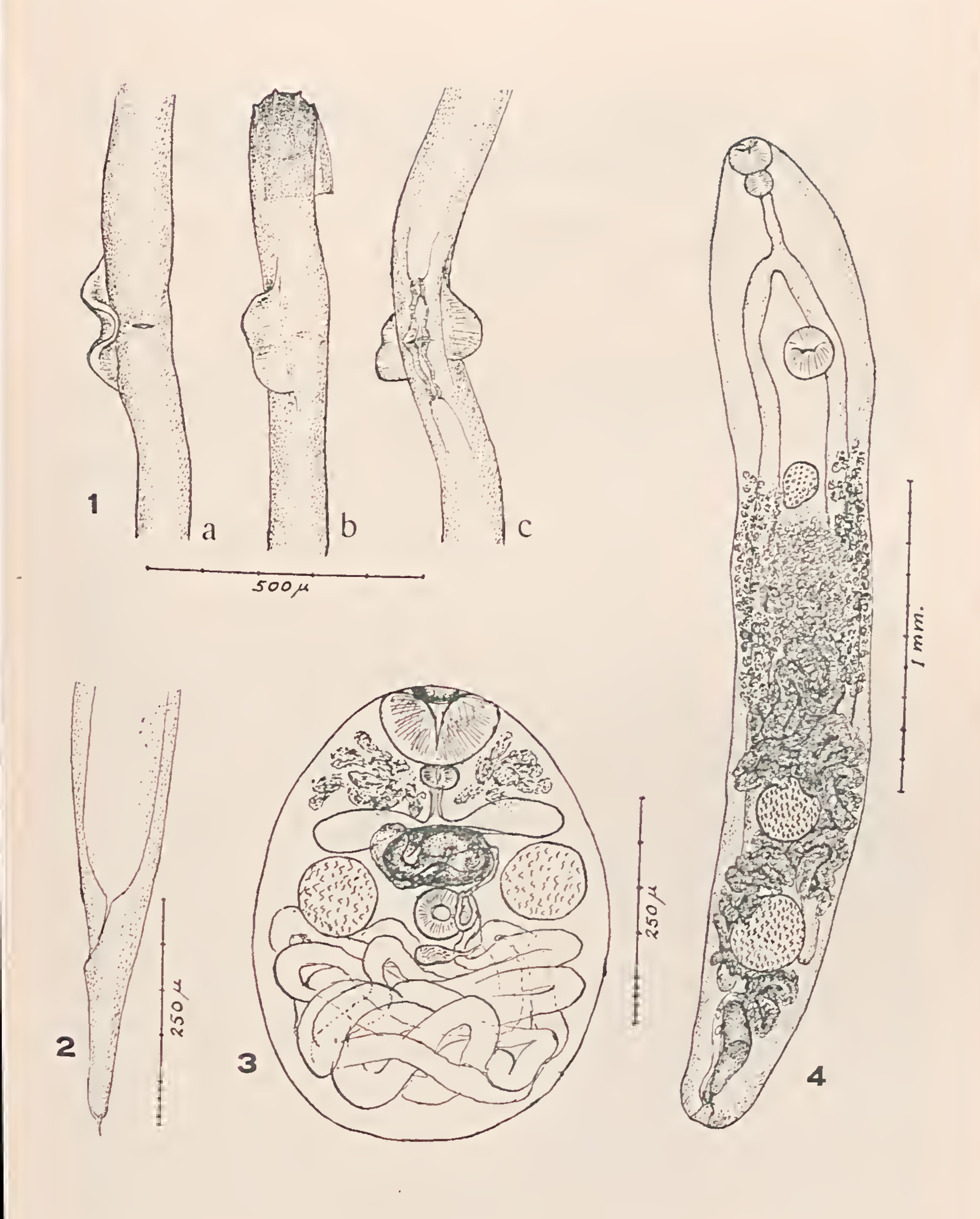
Fig. 1 — *Allintoshius travassosi*. Vulval region of three different females, showing varying appearances of fin-like cuticular expansions. The longitudinal cuticular ridges are shown on the curvature in *b*, and the ovejectors are shown in *c*.

Fig. 2 — *Allintoshius travassosi*. Caudal end of female.

Fig. 3 — *Limatulum diminutum*. Ventral view.

Fig. 4 — *Urotrema shillingeri*. young, fully relaxed individual.

SciELO



Chandler: Parasites of *Nycticeius humeralis*.

The status of Protospirura vs. Mastophorus with a consideration of the species of these genera.

B. G. Chitwood

Zoological Division, Bureau of Animal Industry, U. S. Department of Agriculture - U. S. A.

[With 1 plate]

During the past two years a number of lots of specimens of protospirurids from coyotes were submitted by the Bureau of Biological Survey to the Bureau of Animal Industry for identification. A study of these forms and comparison of them with other specimens available in the U. S. National Museum Helminthological Collection brought to the writer's attention the need for a reexamination of the species involved in order to determine what characters may be regarded as of generic and specific value.

The genus *Protospirura* was proposed by Seurat (1914) with *P. numidica* Seurat, 1914, as type. Later Seurat (1915) transferred the species *Lumbricus muris* Gmelin, 1790, to the genus *Protospirura*, and in 1916 he synonimized *Mastophorus echiurus* Diesing, 1853, with *P. muris*. Since *M. echiurus* was designated as type of the genus *Mastophorus* by Stiles & Hassall (1905), this would appear to invalidate the genus *Protospirura*. However, the species falling into this group are of two very distinct types. The first group, exemplified by *P. numidica*, has bidentate or quadridentate pseudolabia; the stoma is laterally compressed; the caudal papillae are sessile; the male tail is relatively short; and the vulva is usually, if not always, posterior to the middle of the body. The second group, exemplified by *P. muris*, has tri-, penta-, septa-, or novemdentate pseudolabia; the stoma is cylindrical; the caudal papillae are stalked; the male tail is relatively long; and the vulva is anterior to the middle of the body. Because of these differences, it seems reasonable to retain both *Protospirura* and *Mastophorus*, including in *Protospirura* the forms most closely related to *P. numidica* and in *Mastophorus* the forms most closely related to *M. muris* (Gmelin, 1790) n. comb.

Of the species previously placed in the genus *Protospirura*, *P. hamospiculata* Neveu-Lemaire, 1927, has been placed in *Habronema* by Baylis (1931), and *P. guianensis* Ortlepp, 1924, appears to belong to the genus *Spirura*. The « well developed » stoma considered by Ortlepp as typical of *Protospirura* was illustrated in lateral view. The stomata of *Spirura* and *Protospirura* are both laterally compressed, while that of *Mastophorus* is cylindrical or « well developed ». The appearance of the stoma of *P. guianensis*, as shown by Ortlepp, might easily apply to that of *Spirura* or *Protospirura*, but the form of the pseudolabia and the presence of a ventral boss indicate that this species is undoubtedly a member of the genus *Spirura*. The correct name, therefore, would be *Spirura guianensis* (Ortlepp, 1924) n. comb.

As previously defined, the genus *Mastophorus* would include the following species now placed in the genus *Protospirura*: *P. muris*, *P. columbiana*, *P. gracilis*, *P. labiodentata*, *P. ascaroidea*, *P. oligodentata*, and *P. marsupialis*. However, there does not appear to be sufficient reason for the separation of most of the above named species. The characters previously used for their separation appear to be inadequate.

Stomatal length, used by Baylis (1927) and Neveu-Lemaire (1927), depends to a large extent on the limits chosen, since exclusion or inclusion of the pseudolabia and the degree to which they are everted causes much diversity in results in a single species (Table 1).

Other authors have used the number of teeth as a specific character. As pointed out by Hsü (1935), the teeth should be studied by cutting off the head and splitting it longitudinally in order to observe these structures in profile. In his work, however, Hsü confused the prominences of the introdorsal and internoventral papillae with the teeth. The writer of this article found a great variation in the number of teeth in every lot of material examined and in no case were the teeth of a single pair of lips identical.

The absolute length of the spicules has been generally used as a specific character; however, as shown in table 1, there is too great a variation in spicule length for this character to be significant; the same holds true for other body measurements. The number of genital papillae is also variable; there may be 2 or 3 pairs of postanal papillae or, in some cases, the third pair may be represented by a large unpaired papilla.

There appears to be only one morphological character by which any of the forms referrable to the genus *Mastophorus* may be separated. The teeth in specimens from *Rattus norwegicus* as well as those from *Felis catus* are sharper and longer than those from *Geomys*, *Oryzomys*, *Thomomys*, *Peromyscus* and *Canis latrans*; the forms from *Mus musculus* are somewhat intermediate, the teeth being as large as in those from *Rattus norwegicus* but blunt as in those from *Geomys*. The maximum systematic rank that the writer considers practical to give to the forms studied is varietal. Hence the species *Mastophorus muris* is considered as having variety *muris* n. var., with large teeth and a variety *ascaroides* n. var. with small teeth. The forms from *Mus musculus* are lumped for convenience with those from *Rattus norwegicus*. *Protospirura columbiana*, *P. gracilis*, *P. labiodentata* and *P. oligodentata* are considered synonyms of *Mastophorus muris* var. *muris*. *Protospirura marsupialis* is considered a possible synonym of *P. muris*, and a restudy of this form might show it to be identical with one or the other of the two varieties proposed.

The remaining species of *Protospirura*, namely, *P. numidica* Seurat, 1914, *P. muricola* Gedoelst, 1916, *P. bonnei* Ortlepp, 1921, and *P. suslica* Schulz, 1927 are retained in the genus *Protospirura*.

As may be seen in table 2, there are two distinct types of species in the genus *Protospirura*; the first, exemplified by *P. numidica*, has very unequal spicules, the second, exemplified by *P. muricola*, *P. bonnei*, and *P. suslica*, has equal or subequal spicules. Other measurements and host relationships appear to be of little or no significance. Seurat (1916) states that *P. numidica* has 2 or 4 teeth on each lobe of the pseudolabia. In the material from coyotes and from *Peromyscus g. gossypinus* there are 4 distinct or 2 indistinctly divided teeth on each lobe.

Table 1
Measurements of various species of *Mastophorus* [1]

Species	Male Length	Male Width	Male Stoma	Male Esophagus	Male Tail	Male Right spicule	Male Left spicule	Female Length	Female Width	Female Stoma	Female Esophagus	Female Tail	Female Vulva [2]	Host	Locality	Author
columbiana	22–43	0.60–1.2	0.05 / 0.15–0.16	4.2 (1/7)	(1/50)	1.3–1.4	1.03–1.07	45–100	0.80–2.4	0.215	6.4 (1/12)	0.75–1.2	46	*Rattus norvegicus*	U. S. A. (D. C.)	Cram, 1926
	26–28 [3]	0.72–0.88	0.20–0.21	3.44–3.7	0.48–0.64	1.12–1.28	0.89–1.02	40–69	0.72–1.36	0.200–0.300	4.2–6.5	0.32–0.49	39-45	*Rattus norvegicus*	U. S. A. (D. C.)	Chitwood
	12–22	0.56–0.90	0.18–0.24	2.9–4.7	0.40–0.64	1.12–1.32	0.89–1.06	23–38	0.80–1.0	0.200–0.280	3.5–4.08	0.200–0.280	42-45	*Rattus norvegicus*	U. S. A. (D. C.)	Chitwood
marsupialis	30–40	0.80	0.20–0.27	3.6–4.5		1.15–1.35	0.90–1.15	Up to 65	Up to 1.7	0.30–0.34	5.5	0.40–0.50	33	*Trichosurus vulpecula*	North Queensland	Baylis, 1927
gracilis	23.2	0.564	0.041 / 0.141	2.3	0.332	1.1	0.62							*Felis catus dom.*	U. S. A. (D. C.)	Cram, 1924
	23.2 [3]	0.564	0.182	2.3	0.400	1.1	0.62							*Felis catus dom.*	U. S. A. (D. C.)	Chitwood
labiodentata								42	1.3		4.7	0.525		*Mus navalis*	Egypt	Linstow, 1899
muris	34.8	0.720	0.290	3.65		1.17	0.840	26.5	1.1		4.8		45	*Mus decumanus* (*Rattus norvegicus*)	Algeria	Seurat, 1916
	14–28	1.0	0.14	Up to 3.27	0.69	1.2	1.0	15.40	1.75		4.3	0.520	Up to 50	Rodents	U. S. A. (D. C., Okla., Colo.)	Hall, 1916
						1.22–1.27	0.90–1.02							Rodents	U. S. S. R.	Schulz, 1927
	14	0.544	0.190	1.98	0.600	1.016	0.816	20	0.80	0.200	2.8	0.240		*Rattus norvegicus*	U. S. A. (D. C.)	Chitwood
	35-40	1.12–1.2	0.24–0.28	4.6–4.8	0.68–0.80	1.28–1.36	1.08–1.20	72.80	2.0–2.2	0.288–0.300	5.5–6.5	0.440	46	"Rat"	Puerto Rico	Chitwood
	16	0.480	0.16	2.65	0.38	1.0	0.88	38	0.88	0.220	4.4	0.240	37	*Mus musculus*	U. S. A. (Colo.)	Chitwood
	35–45	1.0–1.5	0.13	Up to 4.3	0.86–1.1	1.29–1.43	0.775–0.860	75–85	Up to 2.0	0.155	5.2	1.37–1.46	33	*Geomys breviceps*	U. S. A. (Okla.)	Hall, 1916
	33–42 [3]	1.0–1.2	0.240	3.0–4.2	0.88–1.0	1.4–1.42	0.96–1.04	70–75	1.9–2.0	0.320	5.5–6.5	0.60–0.7	39	*Geomys breviceps*	U. S. A. (Okla.)	Chitwood
	13	0.44	0.150	2.4	0.36	0.88	0.509	23–30	0.64–0.75		2.4	0.240	39	*Canis latrans* (*coyote*)	U. S. A. (Wash.)	Chitwood
	27	0.80		3.28	0.56	1.28	0.804							*Canis latrans* (*coyote*)	U. S. A. (Colo.)	Chitwood
	22–23	1.0–1.2	0.190–0.200	3.5–3.8	0.70–0.72	1.1–1.2	0.68–0.906	45–50	1.5	0.220–0.240	4.0–5.8	0.500	45	*Thomomys fossor*	U. S. A. (Colo.)	Chitwood
								37	0.90	0.200	4.68	0.360	46	*Oryzomys palustris*	U. S. A (Ga.)	Chitwood
	13.20	0.36–0.64	0.14–0.20	2.0–3.2	0.36–0.58	0.88–1.13	0.76–0.88	54	1.6	0.240	5.0	0.280	45	*Peromyscus leucopus*	U. S. A. (Va.)	Chitwood
oligodonta	22	0.498	0.340–0.342	2.8	0.44		0.408	36	0.921	0.035 / 0.048	3.8	0.216	12	*Mus* sp.	Switzerland	Kreis

[1] All measurements in mm. Unless otherwise indicated measurements refer to length. Parenthetical fractions are parts of entire body length. Where block is divided, the figure on the upper line represents width and the lower length.
[2] The position of the vulva is given in percentage of the body length from the anterior end.
[3] Type specimens.

Table 2
Measurements of various species of *Protospirura* [1]

Species	Male Length	Male Width	Male Stoma	Male Esophagus	Male Tail	Male Right spicule	Male Left spicule	Female Length	Female Width	Female Stoma	Female Esophagus	Female Tail	Female Vulva [2]	Host	Locality	Author
numidica	22	0.60	"Short"	7.3 (1/3)		0.830	0.420	Up to 35			7.0 (1/5)	0.180	50	*Felio ocreata Arvicanthus barbarus*	Algeria	Chitwood
	11.5–15	0.40–0.60		3.57–4.16	0.200–0.248	0.94–1.16	0.34–0.36	23–25	0.56–0.60		3.5 +	0.200	60	*Canis latrans*	U. S. A. (Colo.)	Chitwood
	18	0.560		3.75	0.320	1.16	0.400	25	0.80–0.88		4.56–4.8	0.224–0.280	60	*Canis latrans*	U. S. A. (Wyo.)	Chitwood
								26–27	1.0		6–7	0.260	65	*Canis latrans*	U. S. A. (N. Mex.)	Chitwood
								22	0.72–0.76					*Canis latrans*	U. S. A. (Ariz.)	Chitwood
								29.5	0.70		4.5		76	*Canis latrans*	U. S. A. (Ore.)	Chitwood
								17–20	0.68–0.70	0.12–0.13	3.8 4.0	0.32–0.34	63–65	*Peromiscus g. gossypinus*	U. S. A. (Ga.)	Chitwood
	9	0.40	0.15	4.0	0.25									*Peromiscus g. megacephalus*	U. S. A. (Tenn.)	Chitwood
muricola	31	0.80		3.0	0.45	0.35	0.48	50	1.26	0.16	7.5		55	*Cricetomys gambianus* "Rat"	Belgian Congo	Gedoelst, 1916
	15–20 to 25 rare	0.45–0.75	0.13–0.16	3.1–3.9		0.35–0.40	0.43–0.52	20–30	0.90–1.2	0.13–0.16	4.0–6.0			Numerous rodents	Nigeria	Baylis, 1928
	25-30	0.80	0.90	6.2	0.42	0.36–0.39	0.40–0.43	35–52	1.2	0.10–0.13	6.4–7.9	0.40–0.42	Up to 50	*Rattus norvegicus*	Philippine Isl.	Tubangui, 1931
bonnei	Up to 25	0.76				0.395	0.395	Up to 44	1.26		(1/8)	1/100	66	Rat	Dutch Guiana	Ortlepp, 1924
	31–34	0.69	0.115	4.0 (1/75)	0.40	0.455	0.400	48–57	1.0–1.3		5.47 (1/7)		60	*Rattus norvegicus*	Caracas	Brumpt, 1931
suslica	13–77					0.573	0.315						62	*Citellus musicus* *C. planicola* *C. pygmaeus*	U. S. S. R.	Schulz, 1927

[1] All measurements in mm. Unless otherwise indicated measurements refer to length. Parenthetical fractions are parts of entire body length.
[2] The position of the vulva is given in percentage of the body length from the anterior end.

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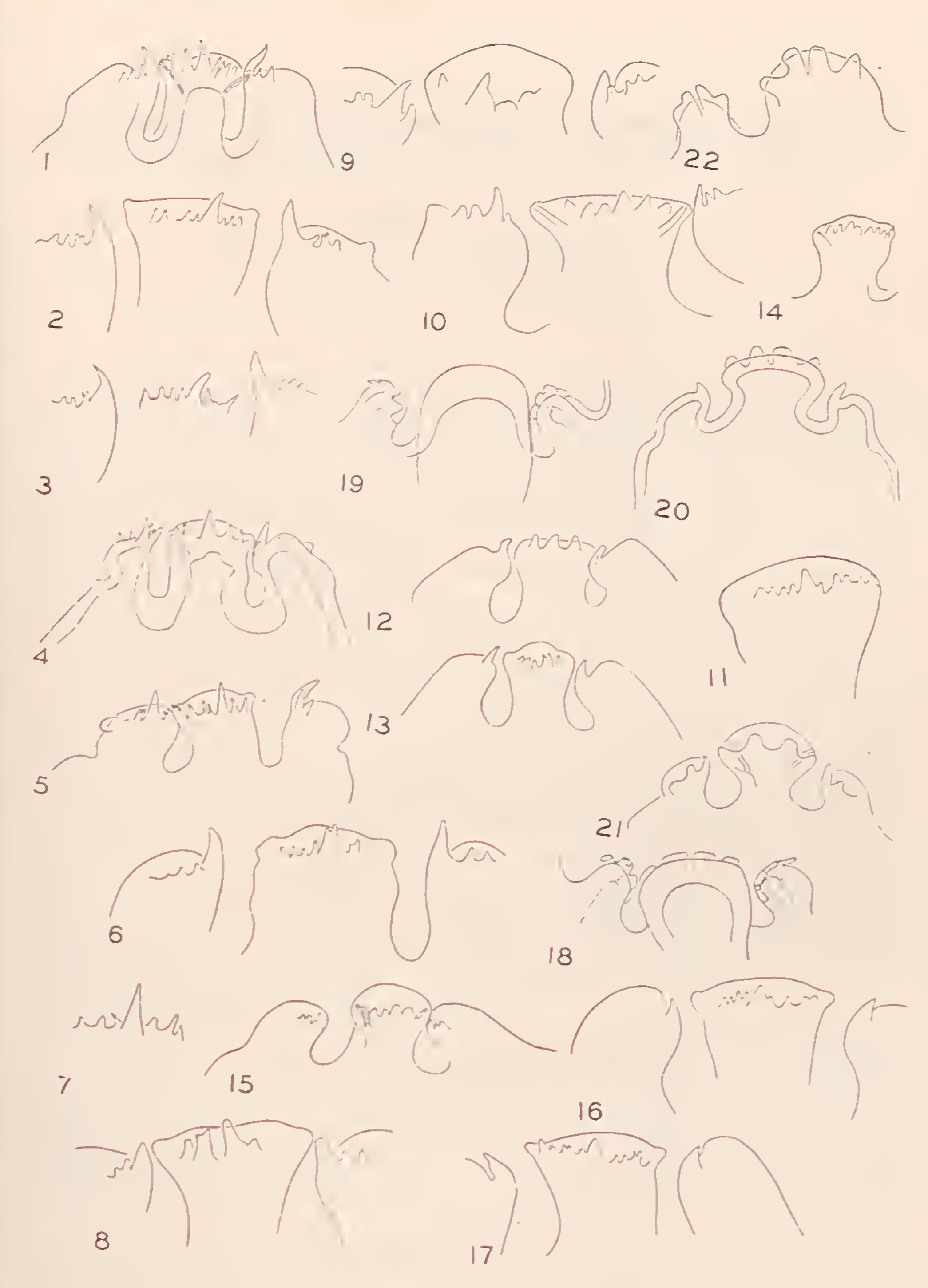
Plate 1

Figs. 1-17 — Sketches showing labial dentition of *Mastophorus muris* from various hosts.

1 — paratype of *Protospirura columbiana* from *Rattus norwegicus*;
2 — from *R. n. albus*;
3 — same as 2, but showing opposite lip;
4 — from same host as 2;
5 — opposite view of lip shown in 4;
6 — external view, from rat ;
7 — same as 6, but internal view;
8, 9, 10 — from *Mus musculus*;
11 — paratype of *P. ascaroidea*, from *Geomys breviceps*;
12-15 — from *Thomomys fossor* (13, opposite lip from 15 opposite lip from 14);
16-17 — from *Peromyscus leucopus* (17 opposite lip shown in 16);

Figs. 18-22 — Labial dentition of *Protospirura numidica*.

18-19 — from *Canis latrans* (opposite lip shown in 18);
20-21 — from *Peromyscus g. gossypinus* (21 opposite lip shown in 20);
22 — from *P. g. megacephalus*.



Chitwood: Status of *Protospirura* vs. *Mastophorus*.

Life History and Epidemiological Studies on the Fox Lungworm, Capillaria aërophila (Creplin, 1839) *

Reed O. Christenson
Department of Zoology, University of Minnesota — U. S. A.

[With 3 figures and 3 graphies]

The fox lungworm, *Capillaria aërophila* (Creplin, 1839) was first found in Europe. Following the initial report others issued from Europe regarding the occasional recovery of the parasite from the respiratory tract of the fox, cat or dog. It was not associated with epizootic disease, however, until 1919, when it was considered the etiologic agent in lung involvement in foxes in Connecticutt. Two years later Allen (1921) said regarding the lungworm: « This parasite may be found in the larynx, trachea, large bronchi; and often producing a chronic catarrhal condition that simulates distemper. The parasite is found in these conditions lying in symmetrical coils. It is very slender and about the same colour as the background and is therefore difficult to see ».

Riley (1921) encountered this parasite in foxes in Minnesota, recording it in 12 % of the animals examined. He, however, in this pioneer work confused the eggs with those of *Trichuris vulpis*. Riley and Fitch (1921) made the same error, stating: « The characteristic eggs of this whipworm were found fairly abundant in 2 out of 21 foxes examined ». There is no doubt, however, as pointed out by the writer (Christenson, 1935) that in both cases the parasite concerned was the lungworm. In 1922, Chandler made fecal examinations on 69 samples from the foxes in Alaska, Canada and six states in the United States. In 17 eggs were found which agreed in morphology with those of the lungworm. Hall (1922 a) found the lungworm obstructing the bronchi of a fox sent to the Bureau of Animal Industry. Later (Hall, 1922 b) he reports the parasite as occurring in the dog, cat, martin and also possibly the wolf, further stating that it is a common parasite of the fox in North America, occurring in 19 of 53 fecal samples. Since these initial reports the lungworm has been found in all areas where foxes have been raised.

There are numerous reports pointing out the seriousness of this parasite in North America. Jeffreys (1928) expressed the opinion that the lungworm occurred exclusively in the United States. Hanson (1928), Geyer (1929), Errington (1930) and Swale (1931) all point out the seriousness of the problem. In central Europe Sprehn (1930) asserts that one can safely estimate a 10 % infection. Freund (1930) speaks insistently of the seriousness of the disease and Noeller & Schmidt (1932) point out that its distribution is apparently great.

* The writer is deeply indebted to Dr. W. A. Riley under whom this problem was developed. He wishes also to acknowledge his gratitude Dr. D. E. Minnich and Dr. R. G. Green for making working facilities available, and to Mr. Edward Fromm for financial support of the problem

Table. 1. Lungworm Incidence in Northwest.

Ranch N.º	*N.º Animals*	*Examination*	*N.º Infected*	*% Infected*	*Locality*	*Date*
1	18	Microscopic	1	22.	Glencoe, Minn.	April, 1928
2	13	Autopsy	0	0.0	Mpls., Minn.	May, 1928
3	7215	,,	938	13.5	Hamburg, Wis.	Nov., 1928
1	22	Microscopic	3	13.6	Hager, Wis.	May, 1929
1	38	,,	0	0.0	Hager, Wis.	May, 1929
5	10	,,	2	20.0	Mpls., Minn.	Aug., 1929
5	3	,,	0	0.0	Mpls., Minn.	Nov., 1929
1	13	,,	7	16.3	Glencoe, Minn.	July, 1930
6	312	,,	2	0.61	Manistique, Mich.	July, 1930
7	12	,,	8	19.	Tanner's Lake, Minn.	Sept., 1930
8	8	,,	3	37.5	White Bear Lake, Minn.	Sept., 1930
8	11	,,	0	0.0	White Bear Lake, Minn.	Sept., 1930
9	116	,,	82	70.7	Robbinsdale, Minn.	Nov., 1931
10	21	Autopsy	0	0.0	Mpls., Minn.	Dec., 1931
10	27	,,	0	0.0	Mpls., Minn.	Dec., 1932

Extensive studies by the writer during the past few years show the gravity of the lungworm problem in the United States. Table 1 gives the results of these investigations. It is of interest to note that the 38 foxes examined in May, 1929 on Ranch 1 were native red foxes captured near Crescent City, Iowa.

In connection with these investigations we had a rare opportunity of studying the results of soil contamination on lungworm increase. At this time climatic conditions were ideal for the development of the eggs. On Ranch 3 most of the pups were raised in farms near Milwaukee, Wisconsin. During late summer animals to be pelted were shipped to the highest, and coldest, part of the state where they were liberated on large furring ranges. In both the breeding pens and the furring ranges soil contamination with feces went on unchecked.

Table 2 gives the results of these investigations. Data for 1927 were collected by Dr. Earl T. Dewey. Examinations were made by opening the trachea with enterotomy scissors after first separating the infrahyoid musculature along the midline. Positive diagnosis rested on gross observation, and while some infections were undoubtedly overlooked, this serves as an index of infection.

Table 2. Rate of Increase in Lungworm Disease.

	1927				1928			
Range	*N.o Examined*	*N.o Infected*	*% Infected*	*Range*	*N.o Examined*	*N.o Infected*	*% Infect.*	*% Increase*
A	2159	138	6.1	A	2417	362	15.0	8.6
F	617	37	6.0	F	238	10	16.0	10.0
H	261	12	4.5	H	368	35	9.2	4.7
K	132	6	4.5	K	1682	157	9.4	4.9
S	445	29	6.5	S	989	149	15.5	9.0
W	1582	149	9.5	W	1551	195	12.5	3.0
Totals	5199	371	6.2 av.		7245	938	12.9 av.	ca. 6.7

LIFE CYCLE

Few observations have been recorded on the life cycle of the fox lungworm. Most workers who express an opinion on the matter concur with Hall (1922), Price (1929) and Secord (1933) that infection results from the swallowing of the embryonated eggs. Price summarizes the probably life cycle in the following words: "The life history is probably direct, as in the case of the whipworms. The eggs are coughed up and swallowed, and pass out in the feces. Under favorable conditions the eggs develop until they contain larvae, and are then infective for other animals. These infective eggs are taken into the digestive tract through contaminated food and water. How the larvae get to the lungs from the digestive tract is unknown, but it may be assumed that they are carried there by the blood stream".

Jeffreys (1928) presented an entirely different picture, one due little credence. He considered an intermediate host to be essential and considered it to be a biting fly. According to his theory fly larvae ingested the eggs which would develop into larvae in the fly. These latter were injected into the blood stream and carried to the lungs.

Although some points are lacking our studies add much new light on the

life cycle of the lungworm. The adult parasites live in the major air passages. Distributional counts made on fox N.º 7.713 are more or less typical of their distribution. A total of 1,361 adults were recovered; 19 occurring in the nasal sinuses: 12 from the laryngeal region; 514 from the trachea and 716 from the bronchi, bronchioles and smaller air passages. In general, however, the more mature forms were in the larger ducts. Here fertilization takes place. The appearance of typical adults *in situ* is shown in figure 1.



Fig. 1 — Adult lungworm *in situ* in the trachea of a fox — natural size

After fertilization the females produce the typical eggs which are discharged into the air passages. These show bipolar truncation, terminating with plug-like opercula. The membrane is finely granular as suggested by Dujardin (1845) and Fiebiger (1928). In colour it is a deep brown, and it measures from 59 to 74 microns, by 32 to 36 microns, the average length being about 65 microns. These ova make their way up the trachea in the phlegm and are swallowed, passing through the digestive tube to the outside. We have considered the morphology of the ova in detail in a previous publication (Christenson 1935 b).

Under normal summer conditions the eggs are embryonated in 35 to 50 days. Fig. 2 shows one containing the developed embryo. When these are swallowed in feces — contaminated food infection results.



Fig. 2 — Embryonated egg of the lungworm after an incubation period of 40 days under optimal conditions

Infection experiments have brought out some interesting facts. Six half-grown ginnea-pigs were fed massive doses of embryonated eggs without success. Similarly six rabbits were negative, no lung involvement being detected at any time and no parasites recovered post-mortem. Two dogs likewise proved negative, although it has twice been reported from this host.

Infections in cats in Europe have been recorded by Wedl (1855), Mueller (1889) and Neumann (1911). In the United States. Chandler (1922) recovered the lungworm from 7 of 27 cats examined in Michigan and Dikmans (1931) reports on specimens taken from a cat at Jeanerette. Louisiana in 1928. We have found it once in this host in Minneapolis. Thus the cat seemed the logical experimental animal. The following table summarizes our experiments:

Table 3. Cat Infection Experiments.

Series n.º	*N.º of animals*	*Date Infected*	*Date Examined*	*Results at Autopsy*
1	3	Feb. 21. '29	Mar. 2—9. '29	Negative
2	6	Aug. 21. '30	Nov. 5—7, '30	Negative (1)
3	3	Sept. 31, '30	Nov. 8—10, '30	Negative (2)
4	10	Mar. 22—July 9. '31	May 13—Sept. 14, '31	Negative (3)

(1) Two animals developed a severe cough on the 8th and 10th days respectively. The controls were normal. Animal N.º 6 passed lungworm ova on the 13rd. day. Post-mortem negative.

(2) All three developed the cough on the 7th and 8th days.

(3) Two developed a cough on the 8th and 10th days. Small hemorrhagic spots were noticed in several and these showed localized inflammatory reaction in sections.

In the above experiments our examination consisted of a routine of gross observation of the major ducts; compressor slide studies of parts of the lung tissues; attempts at Baerman extraction of larvae from teased lobes, and microscopic examination of sectioned and stained materials. In many of our slides localized inflammatory spots suggested a transient pathology.

Achieving this partial success with cats, foxes were next used. A three months old silver fox pup from worm-free parents was selected and fed approximately 50.000 ova. At autopsy it appeared to be perfectly normal. A second pup was given 12 successive doses of embryonated ova at about 5-day intervals. Many of these were found to be passing through the intestine unchanged. The autopsy proved negative. Four additional foxes were fed embryonated eggs during the period from Feb. 16 to Feb. 20, 1932. and examined in April. All proved negative.

This failure to produce infection in foxes led to attempts to achieve it by the mixing of egg-contaminated soil from infected ranches with the animals food. At first this was equally negative until scrapings from the nest-box were used. Ten days after feeding, typical clinical manifestations of lungworm disease were present and an autopsy 21 days after feeding partially developed worms were recovered from the lower air passages.

On the basis of these studies we can say that infection is direct and

no intermediate host is required. Eggs are embryonated in 35 to 45 days under optimal conditions and the larvae reach the lungs by the 7th to 10th day, presumably *via* the vascular system although our examinations of the blood has been negative. The larvae leave the lung capillaries and enter the alveoli, beginning their migration up the air passages. By 40 days they have reached maturity, equal numbers of males and females being present. The females deposit ova which pass up the trachea. or are coughed out directly. Most of the eggs traverse the alimentary canal to the soil.

Two heavily infected foxes were placed on cement floors from which the feces were carefully removed at regular intervals to determine the longevity of the adults. These ceased to discharge eggs in 8 and 11 months respectively.

The morphology of the adults has been considered by the writer (Christenson 1935 a) in a previous publication.

PATHOGENIC EFFECTS

All authorities agree that *Capillaria* can do tremendous damage, heavy infection usually ending fatally. Geyer (1929) states: « Among the parasites that infect our ranches today, lungworm is the most treacherous and destructive. Perhaps more foxes are destroyed by this parasite than all others combined excepting the disease distemper ». Swale (1931) corroborates this statement when he says: « Lungworm infestation is one of the most treacherous parasitic diseases



Fig. 3 — Section through the trachea of a fox showing the ciliated epithelial lining and the lungworm *in situ*. The parasite is cut through the region of the muscular vagina. Eggs are often « trapped » by the adventitious connective tissue covering over the parasites which gives the impression that they are glued to the body of the worm as described by some authors.

with which the fox rancher has to contend». Certain aspects of the pathology have been described by Brandt (1929) and Freund (1930), especially the former.

Brandt records a more or less heavy bronchitis, with a discharge of blood-flecked mucus. The mucus membrane is, as a rule, swollen and red, occasionally with blood clots. The lung tissue is aedematous, with large, reddish atelectatic areas. Bronchopneumonic changes with suppurative discharge may accompany the other conditions. Secondary bacterial complications are frequent. In addition to these conditions we might include inflammation of the trachea, hemorrhage of the nasal mucosa, followed by visible bleeding from the nose, and congestion of the lungs due to the accumulation of mucus and necrotic tissue discharges until the animal may succumb to suffocation. Fig. 3 shows the tissue-parasite relationship in a recently infected animal.

EPIDEMIOLOGICAL STUDIES

Most fox ranchers agree that leaving a pen uninhabited over winter will free it from danger as a source of infection. There is, however, no experimental basis for this conclusion. Moreover, it has been suggested by some writers (Stiles, 1902; Riley & Fitch, 1921; Hanson, 1928 and Daykin, 1934) that heat be used in the sterilization of pens. Nothing is said by these workers regarding the temperatures which must be generated to kill the parasite ova. One of the most common opinions which one finds on the ranch is that shade is essential to the production of good pelts. Most veterinarions, on the other hand, advise against too much shade pointing out that the sun's rays are necessary in the health of the animal. Nothing is given, though, as to how solar radiation affects fox health. That studies are needed to analyse the influence of such factors in the environment of lungworm ova has been stressed by Freund (1930).

As we viewed the problem several things demanded solution: 1, the winter hardiness of lungworm ova, 2) their thermal death point with reference to heat, 3, the relationship of the ultra violet rays to egg mortality, and 4) the ability of the eggs to withstand drying, all of these factors obviously meteorological in their nature.

WINTER HARDINESS OF LUNGWORM OVA

The ova of some helminths have remarkable resistence to cold. Martin (1926) found eggs of *Ascaris suilla* could endure in moist conditions for as long as four years at temperatures ranging between -5° to 10° C. Brown (1928) kept ova of the human and pig *Ascaris* in various developmental stages alive over winter where the temperature fluctuated between -12 and 33° C. Owen (1928) found that between 71 to 80 % of the eggs of the dog ascarid, *Toxocara canis*, survived winter temperatures in the vicinity of Minneapolis where the lowest culture temperature recorded was -26° C. Nolf (1932) found that ova of the human *Trichuris* were susceptible to temperatures a few degrees above freezing if exposed long enough. Eggs exposed 15 days at -3° C. were all killed, whereas at -12° C. only 30 % survived one day's freezing, and none survived 8 days. Further experiments indicated that ova in early cleavage stages were more resistant to cold than later stages. Human *Ascaris* ova,

in comparison to *Trichuris*, were able to withstand these temperatures with no noticeable mortality.

An attempt was made to simulate natural conditions as much as possible in our experiments. Five cultures were prepared by placing formed fecal masses from several infected foxes in shallow screens on the surface of soil-filled flower pots. Soil was added around the edges until only the surface of the feces was visible since digging by the foxes and tramping usually covers it under pen conditions. The cultures were allowed to incubate at room temperature (26 to 28° C) for 77 days until November 7, 1930 when they were examined and 91 % of the ova were found viable. The cultures were then removed to the roof of the zoology building where they were left over winter. Moisture as added or snow removed as needed. The actual culture temperatures were found to agree closely with the atmospheric temperatures as reported by the U. S. Weather Bureau of Minneapolis, whose recordings are used in our graph (Graph 1). Upon warming the ova were found to contain motile larvae. On March 22 counts were made and 50 % of the ova were found to contain living embryos. Some of the ova were fed to cats to test their infectability. The typical symptoms, i. e. wheezing and coughing were noted some 8 days after infection. Two controls were normal. A subsequent examination of the cultures on April 13 showed the same approximate per centage of viability as on March 22. The following graph (Graph 1) records the average daily temperatures for the duration of the experiments.

At the termination of these experiments ova had been subjected to 77 days of incubation at temperatures of 26 to 28° C plus 139 days exposure to rigorous winter temperatures where the lowest actual reading recorded was -26° C. In spite of these 216 days of culturing only 10 % mortality occured. If Noll's findings that early developmental stages of parasite eggs are more resistant are verified, the lungworm can withstand much lower temperatures than recorded here since the ova we used were embryonated when placed on the roof.

HEAT AS FACTOR IN MORTALITY IN LUNGWORM OVA

Several workers have advocated the use of heat to sterilize parasite infested fox pens (Stiles, 1902; Riley & Fitch, 1921; Hanson, 1928; Freund, 1930; Daykin, 1931). No one as yet has reported experiments to determine temperatures lethal to the various ova which might be present. There are, however, in the literature records on the thermal death points on ova of other parasites which are suggestive.

Wigdor (1918) placed eggs of *Toxascaris limbata* in water to which 5 % potassium dichromate had been added and subjected them to an oven temperature varying between 19 to 60° C. At the end of 20 hours they were all dead. Ransom & Schwartz (1919) using decapsulated trichina larvae in saline found that if heated to 50° C they were stimulated to intense activity. With a rise in temperature they became sluggish or quiescent. When raised to 56° C or 56.5° C for five minutes the larvae were killed. A temperature of 55° C attained gradually resulted in the irreversible coagulation of the protoplasm. Lower temperatures were fatal if maintained. Stiles (1921) found that eggs of the hook-

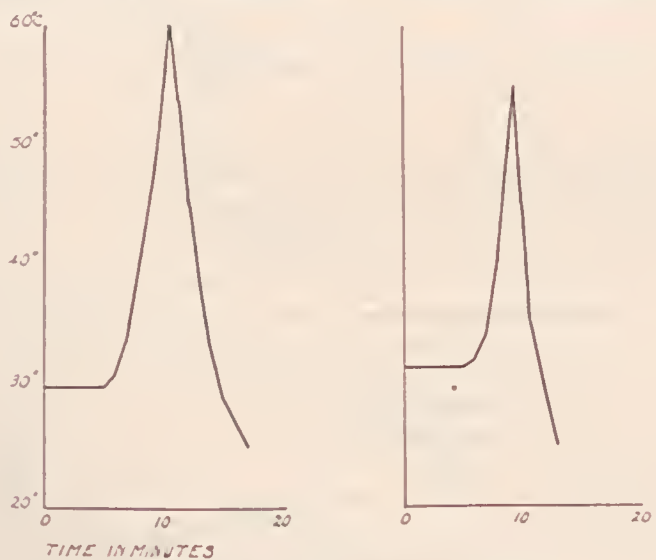


Graph 1. Showing mean daily temperatures during winter egg-culture experiments.

worm were killed at temperatures of 50 to 60° C. in one to five minutes, while above 60° C was instantly fatal. Asada (1923) showed that embryonated eggs of *Ascaris* died when heated to 50° C. for ten minutes or more. Tsutsui (1924) reported that 55° C was the highest temperature to which hookworm cultures could be raised and the larvae not killed. « Encysted » larvae were killed if submerged in 55° C. water, and feces were rendered sterile at 57° C. Caldwell & Caldwell (1928) kept eggs of the human *Ascaris* in moist cultures at constant temperatures of 40 to 50° C and found no development in 11 days, 38 % being disintegrated. The ova of the pig *Ascaris* were more hardy since 17 % were in the morula stage and 17 % beyond the early phase. Ostlund (1932) in unpublished work found eggs of *Toxocara canis* to die between 60 to 65° C in heated water and those of *Ascaris suilla* and *Capillaria aërophila* between 55° C and 60° C. In a dry heat ova of *Ascaris suilla* succumbed to the same temperature as before, namely 55 to 60° C.

In our experiments ova of control-tested fertility were immersed in water while in the one-cell stage and heated with a steam aspirator device to be described in a subsequent note. Beginning at 75° C. cultures were heated at 70, 65, 60, 55, 50, 45, 40 and 35° C. Following the experiments eggs were cultured under optimal conditions for five weeks to test their viability.

The results obtained in these experiments conform closely with the thermal death points reported by other workers on other species. In the case of helminth eggs or larvae the irreversible coagulation of the protoplasm seems to occur between 55 to 60° C. Such was found to be the case with the lungworm. Lower temperatures if sustained are likewise lethal but no adequate quantitative studies have as yet been made to determine the effects of such temperatures on the lungworm. The following graph (Graph 2) shows the actual temperatures and the time consumed in the 55 and 60° C. experiments. (Table 1). The tables (Tables 4 and 5) show the number of ova recovered after the experiments, the number viable, and the percentage of viability at the different temperatures.



Graph. 2 — Showing the actual temperatures and the time consumed in the lethal and sub-lethal experiments.

Table 4. Heat Experiments — Series I.

Culture Number	*Eggs Recovered*	*Number Viable*	*% Viable*	*Temp.*
24	30	28	93.4	35° C
25	13	12	86.7	40
26	17	14	82.3	45
27	10	9	90.0	50
28	18	3	16.6	55
29	12	0	0.0	60
30	18	0	0.0	65
31	10	0	0.0	70
32	8	0	0.0	75

Table 5. Heat Experiments — Series II.

Culture Number	*Eggs Recovered*	*Number Viable*	*% Viable*	*Temp.*
37	31	20	95.3	45° C
38	13	13	100.0	50
39	15	10	66.0	55
40	8	0	0.0	60
41	11	0	0.0	65

Our experiments bring out that temperatures a few degrees below the thermal death point are fatal to many of the eggs. This fact has been noted by other workers for other species. Boeck found a high degree of mortality in Protozoa 10° C. lower than the actual thermal death point. In our experiments there was a marked increase in mortality at 55° C. whereas 50° C had little effect for the time endured. At 60° C all of the ova were killed in both series. This corresponds to the temperature found lethal for lungworm eggs by Mr. Ostlund working in our laboratory using similar conditions of experimentation.

ULTRA-VIOLET RADIATION AS A FACTOR IN EGG MORTALITY

Although the lethal action of ultra-violet rays has been known for many years little has been done in the way of testing the influence of these rays on helminth eggs. That sunlight is lethal aside from the heat generated by the infra-red rays and the resultant drying has been pointed out by many workers.

In 1913 Fauré-Fremiet subjected eggs of *Ascaris megalocephala* to ultra-violet rays and found them affected in two ways: (1) segmentation was diminished often to the point of complete arrest, and (2) anomalies were produced. He found that not all regions of the ultra-violet spectrum, i. e. roughly between 1,600 to 4,000 A° were equally active but that those in the region of 2,800 A° were most effective while those at 2.060 A° were almost nil in their effects. Dognon and Tsang (1928) reported that 10 to 60 seconds radiation of the ova

of *Ascaris megalocephala* at 16° and 10° C was sufficient to kill 10 to 80 % of the ova.

Nolf (1932) in the most critical of the experiments reported on the application of these rays to helminth eggs subjected ova of *Trichuris trichiura* and *Ascaris lumbricoides* to rays generated by two different lamps. The first used was a General Electric Sun lamp type S-1 which gives infra-red and visible light rays, and ultra-violet down to 280 m u (2,800 A°). The second was a mercury quartz arc lamp which gives little of the infra-red and visible rays but ultra-violet extending to 180 m u (1,800 A°). The amount of ultra-violet was measured in terms of Clark's zinc sulphide units (Clark, 1929). Ova were placed on ringed covers, approximately 2,000 ova each, and before using were air dried for a few minutes. After radiation they were cultured to test their viability.

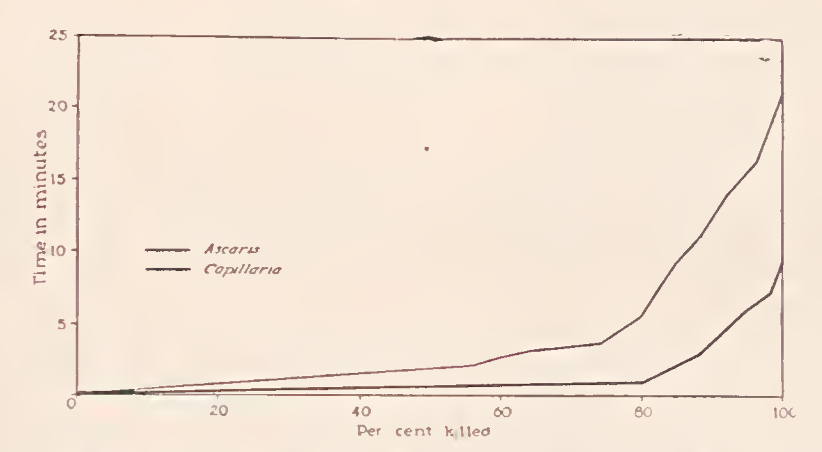
Nolf found little difference in the effect of the two lamps in the first set of experiments. Ova were radiated for one Clark's unit per day, the first cover receiving one, the second two, the third three units and so on until the last had received ten applications on ten successive days. One unit destroyed nearly half of the *Ascaris* eggs but had little effect on those of *Trichuris*. Two units reduced viable *Ascaris* ova to 29 % and those of *Trichuris* to 84 %: Three units destroyed practically all of *Ascaris* ova while 77 % of those of *Trichuris* survived. Using only the mercury quartz arc lamp ova were given continuous radiation. Continuous radiation of two units had nearly as great an effect on *Ascaris* as the three units administered one each on successive days. The effectiveness of the light, however, did not increase thereafter up to a 10 unit exposure. In this third experiment Nolf administered continuous exposures up to 20 units in an attempt to determine the lethal amounts. *Ascaris* ova showed only 1 % enduring 10 continuous units while 11 % of the *Trichuris* ova receiving all 20 units became embryonated. In a fourth experiment of the same sort 1 % of the *Ascaris* ova endured 12 units of exposure and 16 % of the *Trichuris* endured the full 20 units. Nolf concludes that the eggs of *Trichuris* are more resistant to the effects of ultra-violet than those of *Ascaris*, and he explains the difference on the basis of the dark brown colour of the shell of *Trichuris* ova which might absorb the rays.

In our experiments ova were obtained from the proximal third of the uterus of adult lungworms. The debris was removed and the ova placed in Syracuse crystals in a thin film of distilled water and kept in a refrigerator until time for use. Through the courtesy of Dr. Wilhelm Stenstrom, University Radiologist, a new mercury quartz arc lamp and a room was provided for study. The cultures were removed, the super-natant fluid decanted until but a thin film remained, and they were then radiated using a 1.5 amp., 75 volt current at a distance of 12 inches from the culture. Doses of 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 21, 23 and 25 minutes were administered. Following this the eggs were cultured to test the per centage of viability. Controls were set up similar to the experimental lots but were not radiated. As a comparison parallel experiments were run on the ova of *Ascaris suilla*.

The results obtained show that ultra-violet radiation in the doses administered are lethal to 80 % of the lungworm ova in two minutes. (See Graph 3). All of the ova were killed within 10 minutes. In comparison 80 %

of the ova of *Ascaris* were killed in six minutes and all of them within 25 minutes.

It must be noted that in our experiments we have followed the procedure of medical roentgenologists in expressing the amount of exposure in terms of the amount of time consumed, the amount of electral energy used and the



Graph. 3 — Mortality in *Capillaria* and *Ascaris* ova following ultra-violet radiation.

distance from object. This was done because of the present lack of an adequate uniform unit for expressing exposure to ultra-violet radiation. Nolf, on the other hand, used the zinc sulphide unit of Clark in his experiments. Our experiments were completed before the publication of Nolf's paper (completed in April, 1932), and since facilities have not been available to carry on the experiments necessary to directly interpret our results in the terms of his we can draw no direct comparisons unless we consider the collateral *Ascaris* experiments run in both cases. Nolf, however, used the human *Ascaris* ova while we used those of *Ascaris suilla*. These cannot be compared without reservations since the Caldwells (1928) found the ova of latter form more resistant to environmental factors than those of the human species. Graph 3 summarizes our results.

RELATIVE SOIL MOISTURE AS A FACTOR IN EGG MORTALITY

It is a well-known fact that dessication has a deleterious action on the eggs of helminths. Some authorities consider it the most important factor in the distribution of certain parasites (Caldwell & Caldwell, 1928). Although experiments have been performed on the effects of drying on the eggs, no quantitative studies have as yet been published as to the extent of soil drying which helminth eggs will withstand. Brown (1928) allowed ova of *Ascaris suilla* to dry on the walls of test tubes or placed them on filter paper. Eight days of drying was lethal to many eggs, while in 28 days only a few sluggishly motile larvae were found. All were dead in 37 days. The Caldwells (1928) in « plants »

of eggs of the human and pig *Ascaris* found that cultures in direct sunlight, where the maximum culture temperature was 55° C were dead and shrivelled in three days, two and a half of which were clear. In further experiments 15 hours of sunlight (three days exposure) was again lethal. In sandy cultures motile embryos became hyaline in 3 1/2 hours in dry sand, whereas if kept moist under the same conditions 99 % contained active embryos. The maximum temperature recorded was 41° C in these latter experiments. In shade *Trichuris* ova were non viable in 11 days. Eggs kept moist in the sun showed 85 % of the pig *Ascaris* and 11 % of the human *Ascaris* had developed in 30 days. Cultures at varying moisture contents, i. e. (1) with 1 cc. water added daily, (2) 1 cc. added on alternate days, (3) 1 cc. every fourth day, and (4) a saturated culture showed eggs to develop more rapidly in 15 days in cultures 2 and 3 than in the saturated medium. It took 3 to 4 weeks for development in culture 4 to approximate that in other cultures. In the case of these experiments, however, the Caldwells fail to differentiate nor do they mention the interrelationship which might occur between the factors which might be acting as lethal agents.

Spindler (1929) isolated eggs of the human *Ascaris* and *Trichuris* from the feces, placed them on cover slips, and dried them under controlled temperature and humidity. At 22° C with a relative humidity of 57 %, 97 % of the eggs were dead in eight days, and at 30° C. 96 % of the eggs were dead. Eggs left exposed to dry in the laboratory were 70 % of them dead in 13 days, and 93 % in another series in 15 days. With a rise in relative humidity to 77 % at 22° C the eggs died more rapidly, 1 % being alive the 6th day and none on the 12th. A saturated atmosphere at 30° C showed 95 % mortality in 7 days, and complete mortality in 12 days. A second set of experiments gave similar results, whereas a third showed 5 % alive the 16th day. At 22° C they died more slowly, 7 % being alive the 7th day, and 6 % on the 20th day. In a second series only 22 % were dead on the 5th day. On the 38th day 76 % were dead and 21 % embryonated. In another experiment 67 % were dead on the 13th day and 66 % on the 21st.

Eggs were then incubated by Spindler in watch glasses on wet and dry soil. Eggs of dog *Trichuris* were pipetted into the surface of the soil and incubated at 22° C and 30° C in a saturated atmosphere. On dry soil at 30° C, 98 % were dead in 29 days. At 22° C. death was not so rapid, 29 % being in late morula stage on the 29th day.

In our work eggs of known fertility in the fresh feces of foxes were placed in butter moulds with sterile soil of varying moisture contents. The moisture content was determined by the standard method of the Bureau of Soils by weighing a small sample, heating it in a baking oven to drive off the moisture (106° C for 2 hrs) and reweighing.

These studies (Table 6) show that ova of the lungworm are susceptible to drying, death occurring in two weeks at fluctuating humidities and a temperature of 26 to 28° C with a moisture content between 1.6 and 2.3 %. In sealed cultures varying from 5.6 to 7 % moisture content eggs developed with but slight mortality. From this per centage up to water the eggs will develop in the minimum time, other factors being optimal.

Table 6. Relative Soil Moisture Experiments.

Culture N.o	*Soil Type*	*Date started*	*% Moisture*	*Results*
1	Humus	May 25, 1932	1.6- 2.3 %	Ova degenerated in 2 wks.
2	Sand	May 25, 1932	1.6- 2.3 %	Ova degenerated in 10 days.
3	Loam	May 26, 1932	15 to 13.6 %	94% embryonated in 40 days.
4	Loam	May 26, 1932	10.2- 9.1 %	93% embryonated in 40 days.
5	Loam	May 17, 1932	5.6- 7 %	85% embryonated; 95% in control

Cultures were examined at 5 day intervals and the results recorded.

SUMMARY AND CONCLUSIONS

These studies show that the lungworm problem is a serious problem in all regions where foxes are raised. In our limited examination of wild foxes from one locality the parasite was not found. Cats, however, naturally harbour the parasite and can experimentally be infected. Although reported from dogs our two attempts to infect this host were negative. Rabbits and guinea pigs were like-wise refractory to its invasion.

The life cycle may be briefly summarized as follows: Adult parasites live largely in the major air passages and nasal sinuses. After copulation the females produce eggs which are either coughed out or are swallowed traversing the alimentary canal to the soil. After a period of some 40 days under optimal conditions these are embryonated and infective. Infection results following the ingestion of embryonated ova in contaminated food or water. The larvae are liberated in the intestine, presumably migrate to the blood stream and are carried to the lungs where they penetrate the alveoli. This requires 7 to 10 days. As the parasites grow they tend to migrate up the air passages where they come to maturity in about 40 days. The longevity of the adults is less than one year.

The pathology is briefly discussed. Epidemiological factors governing lungworm growth are cold, heat, ultra-violet radiation and dessication. Lungworm ova overwinter in these latitudes. They die at temperatures between 55 and 60° C. although some will not survive the lower extreme. Ultra-violet radiation is lethal to them under experimental conditions, more so than to *Ascaris suilla*. These rays in the solar radiation are probably an important factor in controlling the parasite. Drying is likewise lethal as they will not develop and soon degenerate in relative soil moistures below 2.3 %. Above 5.6 to 7 % moisture content some ova die but many develop in a normal fashion.

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Uma nova especie do genero Tanusiella Enderlein, 1916 *

(Orthoptera: Pseudophyllidae)

A. da Costa Lima
Instituto Oswaldo Cruz, Rio de Janeiro — Brasil

[Com 1 estampa]

O Professor Lauro Travassos, excursionando á Serra da Bocaina (São Paulo), teve o ensejo de apanhar o insecto que descrevo linhas adeante.

Trata-se de uma especie do genero *Tanusiella* Enderlein, 1916, até agora exclusivamente representado pela *T. guttifera* Enderlein, 1916 apanhada no Espirito Santo.

É possivel que a forma aqui estudada seja uma variedade, ou talvez mesmo uma simples variação do insecto que Enderlein descreveu. Todavia o aspecto das azas em *T. guttifera* absolutamente não está de accordo com o que se observa em nosso exemplar (v. fig. 5). Dahi consideral-o pertencente a uma nova especie, que designo *Travassosi*, contribuindo, assim, á justa homenagem que se presta ao amigo e collega Prof. Lauro Travassos.

Além de photographias, de frente (fig. 1) e de perfil (fig. 2), do insecto, junto outras tiradas em vida, de modo a se poder fazer uma idéa da attitude curiosa assumida pelo mesmo quando alarmado ou irritado. Fica, então, immovel e, levantando immediatamente as tegminas, exhibe as azas — que tambem se elevam — e urotergitos proximaes, vivamente coloridos (figs. 3 e 4). Nesta attitude o insecto permanece, ás vezes, mais de um minuto, permittindo que se o photographe em pose, como o fez o Snr. J. Pinto ao tirar taes photographias.

Tanusiella Travassosi n. sp.

Femea. — Cabeça parda, variegada de amarello claro, esverdeado; de cada olho, para traz, uma faixa desta mesma côr.

Antenna de côr parda escura, apresentando 1 distinctos anneis amarellos, claros; na esquerda, o 1.º annel (a 8,5 mm. da base) comprehendendo o 11.º segmento e a parte proximal do 12.º; o 2.º (a 16 mm. da base), comprehendendo o apice do 20.º, o 21.º, o 22.º e o 23.º, em sua maior extensão; o 3.º, comprehendendo parte do 39.º, o 40.º, o 41.º, o 42.º e parte do 43.º; na direita, o 1.º annel (a 8 mm. da base), comprehendendo o 9.º, 10.º e parte do 11.º segmento; o 2.º (a 11 mm. da base), comprehendendo do apice do 18.º, o 19.º e parte do 20.º; o 3.º, abrangendo o 33.º, o 34.º, e o 35.º segmentos. Os segmentos proximaes, especialmente o 1.º, apresentam-se variegados de amarello claro.

* É curioso que o Zoological Record, até o volume correspondente a 1936, não tenha feito referencia alguma ao genero *Tanusiella*.

Pronotum da mesma côr da cabeça: com 2 faixas dorsaes longitudinaes, amarellas pallidas, esverdeadas, que, continuando as 2 da cabeça, se dirigem para traz e para dentro, até o 2.º sulco transversal e dahi divergem um pouco para fóra até a terminação no bordo posterior do pronotum; em varios pontos do pronotum ha pequenas maculas redondas, negras e um tanto salientes, umas maiores e outras menores.

Pernas de côr amarella pallida, esverdeada, com faixas e maculas de côr parda; as tibias, comquanto distinctamente variegadas de pardo, não apresentam as 2 ou 3 largas faixas pardas que se vêm nos femures; tarsos de côr parda uniforme. Ambas as saliencias esternaes conicas, porém de vertice arredondado.

Abdomen, em cima e no meio, com forte carena longitudinal; os 4 tergitos proximaes de côr amarella clara, esverdeada (no fim de alguns mezes esta côr se transformou em ocracea ferruginosa) com a parte adjacente ao bordo posterior de côr verde e, de cada lado, com 6 pequenas maculas negras, circulares e desiguaes. Placa supragenital trapezoidal, margem posterior récta.

Tegminas tendo o campo anterior, isto é, a parte situada adeante da nervura media — que é verde clara — côr de chocolate escura, com varias das cellulas tendo, no meio, um macula verde; nesta parte escura ha uma pequena faixa purpurea, de cerca de 2 mm. de comprimento por 1 mm. na parte mais larga, obliquamente dirigida da nervura média (no ponto de união dos 3/5 internos com os 2/5 externos) ao bordo anterior; o campo posterior isto é, a parte da tegmina situada para traz da nervura mediana, exceptuando uma pequena area apical, occupada por cerca de 12 pequenas cellulas, com a mesma côr do campo anterior e tambem apresentando no centro pequeninas maculas verdes, é de côr identica a da faixa obliqua do campo anterior, isto é, de um vermelho purpureo, mais ou menos enfuscado para o bordo posterior; algumas das cellulas ao longo deste bordo apresentam pequena area pallida no centro.

Azas (v. fig. 5), em sua maior extensão, negras, porém, com pontos ou linhas de côr purpurea e pequenas areas translucidas, de tamanho e formas variaveis, situadas no meio das cellulas; a parte apical e restante, da aza, de contorno quasi circular, é de côr vermelha purpurea, e nella se acham incluidas 2 areas purpureas, esbranquiçadas, uma maior e uma menor perto do apice da aza.

Comprimento: do corpo 22 mm.; do pronotum 4,75 mm.; das tegminas 12 mm.; da aza 8,5 mm.; do femur anterior 10,5 mm.; do femur posterior 20 mm.; da tibia posterior 22,5 mm.; do ovipositor 11,5 a 12 mm. Maior largura das tegminas 8 mm.

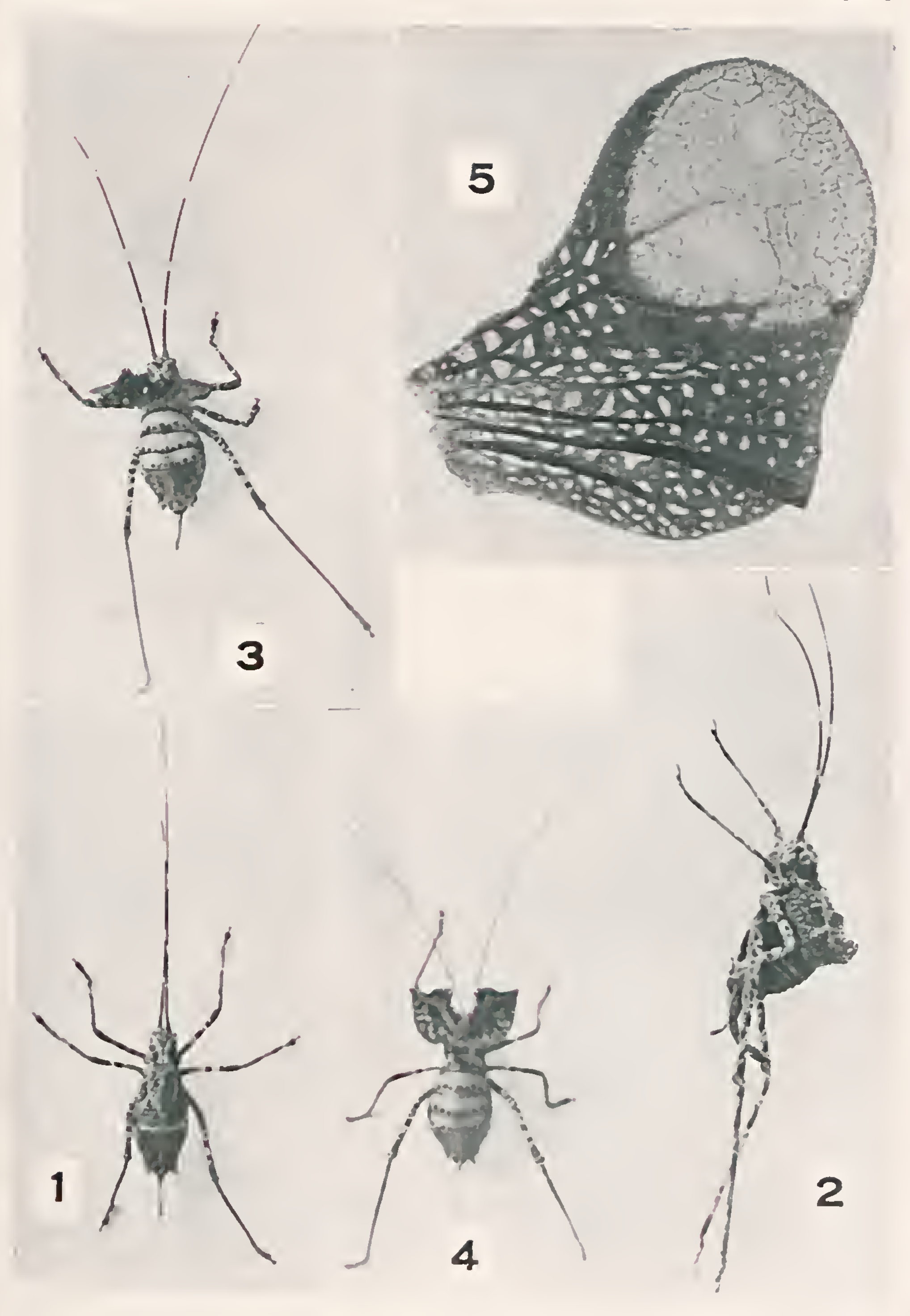
HOLOTYPO: — 1 femea apanhada pelo Prof. Lauro Travassos na Serra da Bocaina (S. Paulo), 8-I-1937; n.º 2871 da collecção do Instituto Oswaldo Cruz.

Estampa 1

Tanusiella Travassosi n. sp.

Fig. 1 — Exemplar visto pelo dorso.
Fig. 2 — Exemplar de perfil.
Figs. 3 e 4 — Attitude observada quando o insecto está irritado.
Fig. 5 — Aza, detalhe.

Photos J. Pinto.



Costa Lima: Nova especie do genero *Tanusiella.*

Sobre um novo genero de ciliado parasito da capivara Toxodinium n. gen.

A. M. da Cunha
Instituto Oswaldo Cruz, Rio de Janeiro — Brasil

[Com 2 figuras no texto]

Ha tempos, em collaboração com o Dr. Julio Muniz descrevemos algumas novas especies de ciliados parasitos do intestino da capivara (*Hydrochoerus capybara*) incluindo-as no genero *Cyclopostium*. Reexaminando o nosso material verificamos que o sentido que davamos nessa epoca ao genero *Cyclopostium* era demasiado amplo, em desaccordo com o que acontece com outros ciliados incluidos em generos diversos tendo por base differenças bem menores do que aquellas existentes entre algumas das especies então descriptas.

Entre essas destaca-se a especie denominada *Cyclopostium vorax*.

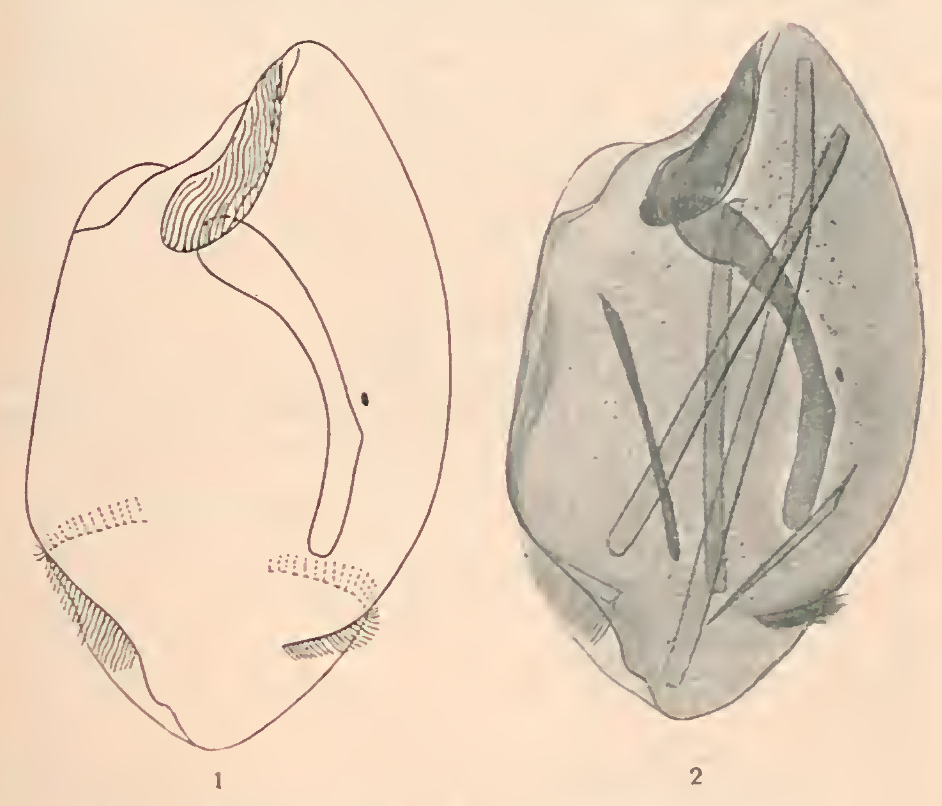


Fig. 1 — Eschema de organisação do genero *Toxodinium*.
Fig. 2 — *Toxodinium vorax*

Na especie-typo do genero *Cycloposthium*, *C. bipalmatum* parasita do cavallo, bem como em outras especies do mesmo genero, existe na parte posterior dois tufos de cilios collocados um na face ventral, outro na dorsal que se inserem em curtos appendices constituindo as organellas denominadas *caudalia*. Pois bem, no *Cycloposthium vorax* esses appendices são substituidos por duas linhas de cilios que contornam o corpo do ciliado e que se acham collocados na superficie mesmo do corpo, que não apresenta no ponto de inserção dos cilios nenhuma saliencia. Essas linhas formam dois arcos, um na face ventral, outro na dorsal e contornam o corpo quasi completamente apresentando apenas curtas interrupções nos dois lados do corpo do ciliado.

Occorre ainda que essa especie, embora possua uma membrana espessa, é completamente desprovida do revestimento esqueletico encontrado nas diversas especies do genero *Cycloposthium*. A falta de esqueleto externo acarreta a inexistencia do bastonete esqueletico dorsal (*Leiste* de Bundle, *tigella* de Gedoelst).

Essas differenças que acabamos de apontar mostram não ser possivel a permanencia dessa especie no genero *Cycloposthium*. A inexistencia do revestimento esqueletico levou Strelkow a criar o novo genero *Trifascicularia* que em tudo o mais, se assemelha aos generos *Tricaudalia* e *Tripalmaria*. Hoare, em trabalho recente, estabeleceu tambem um novo genero dotado de tres *caudalia*, differenciando-se do genero *Tricaudalia* apenas pela disposição do revestimento esqueletico.

No caso em questão, além da ausencia do revestimento esqueletico que se póde facilmente verificar no desenho que acompanha o trabalho, existe ainda a differença na forma das *caudalia* que são aqui substituidas por linhas de cilios dispostos em arcos.

Achamos pois acertado, a criação para essa especie de um novo genero cuja diagnose damos a seguir.

Toxodinium n. gen.

Cycloposthiidae desprovido de revestimento esqueletico e de bastonete esqueletico dorsal. Os *caudalia* são substituidos por duas linhas de cilios dispostas em arco, collocadas na parte posterior, uma na face ventral, outra na dorsal.

ESPECIE TYPO: — *Toxodinium vorax* (Cunha & Muniz, 1926).

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Trypanosoma de um Roedor, Marmota flaviventris nosophora, achado em Montana, Estados Unidos.

Emmanuel Dias
Instituto Oswaldo Cruz, Rio de Janeiro — Brasil

[Com 1 figura no texto]

Durante nossa estadia no Rocky Mountain Laboratory, Hamilton, Montana, em Abril-Maio de 1937, foi-nos dado ensejo de examinar o sangue de alguns animaes, á procura de protozoarios.

Além de um pequeno morcego, ainda não identificado, examinámos 4 especies de Roedores: 1 «woodchucks» (*Marmota flaviventris nosophora*), 4 «ground-squirrels» (*Citellus columbianus*), 1 porco-espinhos (*Erethizon epixanthum*) e 1 *Peromyscus* sp. Em 14 destes animaes a pesquiza de hemo-parasitos, feita a fresco, em gottas espessas e em esfregaços, foi negativa; apenas em 1 «woodchuck», caçado na estrada do Skalkoho, proximo a Hamilton, abundavam trypanosomas no sangue peripherico.

Em estado fresco os parasitos são dotados de rapido movimento de translação, depressa atravessando o campo microscopico, deslocando os globulos vermelhos. Após coloração de esfregaços (alcool absoluto, Giemsa), observam-se os detalhes de sua estructura, cujas principaes caracteristicas são: Nucleo oval, situado geralmente na parte média do corpo; blepharoplasto arredondado ou em curto bastonete, collocado a alguma distancia da parte terminal; extremidade posterior afilada ou arredondada, não muito alongada; membrana ondulante quasi sem pregas e muito estreita; protoplasma raras vezes encerrando granulações chromaticas e zonas vacuolares menos coradas; longo flagello livre.

Medidas realisadas em 10 trypanosomas desenhados á camara clara (v. fig.) mostraram os seguintes resultados, em *micra*:

	Média	*Extremos*
Extremidade posterior — Blepharoplasto	2,1	1,4 — 2.8
Blepharoplasto — Nucleo	4,3	1,7 — 9,1
Nucleo (maior diametro)	1,7	1,4 — 2.1
Nucleo — Extremidade anterior	9,2	1.9 — 11.9
Flagello livre	11.5	9.1 — 20.3
Comprimento total	29,7	27.3 — 32.9
Largura ao nivel do nucleo	1,5	1,4 — 2.1

Não foram vistas fórmas de multiplicação no sangue; apparentemente todos os trypanosomas eram fórmas adultas, havendo já transcorrido a phase de proliferação.

Pelas suas caracteristicas morphologicas este *Trypanosoma* figura no grande

grupo do *Trypanosoma lewisi*, cujos numerosos representantes encontram-se principalmente em Roedores (*T. duttoni. T. criceti, T. cuniculi, T. microti, T. peromysci, T. neotomae*, etc.), em Insectivoros, Desdentados, Carnivoros e Primatas.



Trypanosoma parkeri. — Fórmas do sangue periphérico da *Marmota*, marcadas de lamina fixada pelo alcool absoluto e corada pelo Giemsa.

Por occasião da nossa visita á Universidade da California em Los Angeles tivemos opportunidade de mostrar nossos preparados á Dra. F. D. Wood, que por sua vez nos fez examinar seu material de outros trypanosomas de roedores, entre os quaes o por ella recentemente descripto, *Trypanosoma neotomae*,

parasito dos ratos *Neotoma fuscipes annectens* e *Neotoma fuscipes macrotis*. As dimensões de *T. neotomae* e de *T. lewisi* segundo Wood (1936, p. 134) são bastante proximas das que obtivemos do parasito da *Marmota*. Por exemplo, o comprimento total destes tres flagellados é, respectivamente, 29,1 — 29,2 — e 29,7 *micra*, em média.

A Dra. Wood teve ainda a bondade de passar em revista a bibliographia americana sobre o assumpto, verificando não se achar assignalado o trypanosoma do *woodchuck*, o que então fizemos (Dias, 1936), deixando para mais tarde a descripção do flagellado.

O exemplar de *Marmota* infectado era portador de infestação por pulgas do genero *Thrassis*, em que infelizmente não pesquisámos fórmas de evolução do protozoario. Porém, a frequencia do parasitismo daquelles roedores de Montana por taes siphonapteros é uma indicação da possibilidade de serem elles os transmissores naturaes do hemoflagellado.

— Si cada um dos trypanosomas do grupo *lewisi* constitue ou não uma boa especie, ou quantas especies ou sub-especies encerra o referido grupo, é actualmente impossivel dizer-se, não só devido á deficiencia de conhecimento sobre muitos delles, como, sobretudo, pela inexistencia de um critério seguro a adoptar. Morphologicamente, todos elles têm caracteristicas geraes muito proximas, e as ligeiras variações de estructura que em alguns delles se observam, posto que em certos casos possam servir para distinguir com relativa segurança determinado trypanosoma de um ou dois outros, não seriam entretanto bastantes para permittir sua caracterisação entre todos os demais.

Biologicamente, em geral todos os parasitos deste grupo não são pathogenicos e são dotados de grande especificidade em relação aos hospedadores naturaes. Esta ultima circumstancia tem prevalecido como elemento para sua distincção, não obstante saber-se relativo esse caracter da especificidade, de valor systematico muito questionavel.

Presentemente, admittir-se uma unica especie, *T. lewisi*, para todos os trypanosomas do grupo, ou acceitarem-se muitas *especies* ou *sub-especies*, são pontos de vista que podem ser arbitrariamente adoptados, porquanto não dispomos de elementos para estabelecer um criterio decisivo.

Para designar o parasito que encontrámos no sangue do *woodchuck* de Montana suggerimos o nome *Trypanosoma parkeri*, em homenagem ao Director do Rocky Mountain Laboratory, Dr. R. R. Parker.

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Liste systématique des Strigéidés du Brésil et du Venezuela

Georges Dubois
Neuchâtel – Suisse

(Avec 1 planche)

Les Strigéidés du Brésil et du Venezuela ont été l'objet de plusieurs études dont les plus importantes sont celles de Westrumb (1823), Diesing (1850, 1855, 1858), Brandes (1888, 1890), Krause (1914), Lutz (1928), Szidat (1928, 1929), Dollfus (1935) et Dubois (1935, 1936 a et b, 1937). La majeure partie d'entre elles sont basées sur l'examen des riches matériaux collectionnés par Johann Natterer, lors de ses voyages au Brésil (1817-1835), et déposés au Musée d'Histoire Naturelle de Vienne. Celle que publia Lutz, en 1928, est consacrée aux Trématodes du Venezuela.

Les espèces connues actuellement sont au nombre de 55. Treize, seulement, figurent dans le catalogue des Trématodes brésiliens publié par Viana (1924). C'est la raison pour laquelle il nous a paru utile d'établir une liste systématique des Strigéidés du Brésil et du Venezuela, dans laquelle il soit possible de trouver les indications concernant la synonymie, la bibliographie, les hôtes et les collections[1] de chacune des espèces.

Familia STRIGEIDAE Railliet, 1919.

Subsubfamilia *Strigeini* Dubois, 1936 *a*.

Apharyngostrigea brasiliana Szidat, 1928, p. 205, 207, 210; 1929, p. 710, 714-715, fig. 15; Lutz, 1931, p. 340-351. Hôte: *Cochlearius cochlearius* (L.). Collection: Mus. Wien, 511. Il est probable que *Strigea ardearum* Lutz, 1928, p. 118, 120, parasite de Hérons diurnes et nocturnes, soit identique.

Ophiosoma microcephalum Szidat, 1928, p. 205, 208, 212; 1929, p. 719, 721, fig. 19. Hôtes: *Buteo magnirostris* (Gm.), *Circus cyaneus* (L.). Collection: Mus. Wien, 18, 30, 236, 260.

Parastrigea cincta (Brandes, 1888) Szidat, 1928, p. 205, 208, 212; 1929, p. 717, fig. 16. Syn. *Holostomum cinctum* Brandes, 1888, p. 67; 1890, p. 564, 594, pl. XLI, fig. 21, 22; Linstow, 1889, p. 53; Braun, 1892-93, p. 903; Viana, 1924, p. 103, 159, 166, 176, 182. Hôte: *Ardea* sp. Collection: Mus. Wien, 199.

Strigea bulbosa (Brandes, 1888) Szidat, 1928, p. 205, 207, 210, 211; 1929, p. 702-703, fig. 9 *a*, *b*. Syn. *Holostomum bulbosum* Brandes, 1888, p. 67; 1890,

[1] Mus. Wien = Naturhistorisches Museum, Wien; Mus. Berl. = Zoologisches Museum der Universität, Berlin; Inst. Zool. Univ. Nap. = Instituto di Zoologia, R. Università di Napoli; Rossitten = Institut für Schädlingsforschung, Rossitten, Kur. Nehrung; U. S. N. M. = United States National Museum, Washington, D. C.

p. 595; Linstow, 1889, p. 12, 51; Braun, 1892-93, p. 903; Viana, 1921, p. 103, 159, 165, 168, 176, 182; *Holostomum megalocephalum* Brandes, 1888, p. 67; 1890, p. 595; Linstow, 1889, p. 90; Braun, 1892-93, p. 903; Viana, 1921, p. 131, 159, 183, 185; Szidat, 1928, p. 210; 1929, p. 703, 752-753. Hôtes: *Theristicus caudatus* (Bodd.) = *Geronticus albicollis*. *Ajaia ajaia* (L.)[2], *Elanoides forficatus* (L.) = *Nauclerus furcatus*. *Nyctibius grandis* Gm. Collections: Mus. Wien, 11, 21; Inst. Zool. Univ. Nap., 122.

Strigea elliptica (Brandes, 1888) Szidat, 1928, p. 205, 207, 211; 1929, p. 691, 702, fig. 8. Syn. *Holostomum ellipticum* Brandes, 1888, p. 67; 1890, p. 595; Linstow, 1889, p. 10; Braun, 1892-93, p. 903; Viana, 1921, p. 115, 159, 168, 180, 183. Hôte: *Bubo magellanicus* Gm. Collection: Mus. Wien, 277.

Strigea falconis var. *brasiliana* Szidat, 1929, p. 698, fig. 5. Hôtes: *Buteo albicaudatus* Vieill. = *Falco pterocles*. *Buteo magnirostris* (Gm.), *Falco striatus* Vieill., *Herpetotheres cachinnans* L., *Spizaëtus ornatus* (Daud.). Collection: Mus. Wien, 9, 107, 138, 153, 167, 256, 266, 275. *Strigea ornithocystis* Lutz, 1929 serait semblable ou identique à *S. falconis brasiliana* Szidat [Lutz, 1929, p. 129].

Strigea nugax Szidat, 1928, p. 205, 208, 211; 1929, p. 705-706, fig. 11; Neveu-Lemaire, 1936, p. 216, 217. Hôte: *Rhea?* ou *Mycteria americana* L. Collection: Mus. Wien, 2.

Strigea sphaerocephala (Westrumb, 1823, *nec* Brandes, 1888), Dubois, 1937, p. 391-392. Syn. *Amphistoma sphaerocephalum* Westrumb, 1823, p. 396; *Holostomum sphaerocephalum* (Westrumb) Diesing, 1850, p. 311; Creplin, 1851, p. 281; Linstow, 1878, p. 79; 1889, p. 32; Braun, 1892-93, p. 903; e. p. Viana, 1921, p. 118, 159, 190; *Holostoma westrumbii* Cobbold, 1860, p. 15; Viana, 1921, p. 118, 183, 191; Szidat, 1929, p. 760; *Holostomum unciforme* Brandes, 1888, p. 66 (*nec* Rudolphi, 1819); 1890, p. 591; *Strigea sphaerocephala* (Diesing) Skrjabin, 1923, p. 251; *Strigea unciformis* Szidat, 1928, p. 205, 207, 211, 213 (*nec* Rudolphi, 1819); 1929, p. 701, fig. 7. Hôtes: *Pyroderus scutatus* (Shaw) = « *Coracias jugularis* », *Ostinops decumanus* Pall. = *Oriolus cristatus* Bodd. Collection: Mus. Wien, 23, 146.

Strigea vaginata (Brandes, 1888) Szidat, 1928, p. 205, 207, 210; 1929, p. 701-705, fig. 10 *a*, *b*; Lutz, 1931, p. 311 (352). Syn. *Holostomum vaginatum* Brandes, 1888, p. 64; 1890, p. 591, pl. XLI, fig. 21; Linstow, 1889, p. 11; Braun, 1892-93, p. 904; Viana, 1921, p. 153, 159, 167, 183, 191; Lutz, 1929, p. 129; *Gongylura vaginata* (Brandes) Lutz, 1933, p. 34-35, 37-40, 41-42, (52-53, 54, 56, 58, 59-60); *Strigea ophiocystis* Lutz, 1928, p. 118; 1929, p. 129. Hôtes: *Cathartes urubitinga* Pelzeln, *Coragyps atratus* (Bechst.) = *Vultur urubu*, *Sarcorhamphus papa* (L.), *Spizaëtus ornatus* (Daud.), *Cariama cristata* (L.)[3]. Collections: Mus. Wien, 31, 36, 93, 103, 136, 211, 258; Mus. Berl., 2197; Rossilten.

Subsubfamilia *Cotylurini* Dubois, 1936 *a*.

Apatemon globiceps Dubois, 1937, p. 392 nom. nov. pro *Apatemon sphaerocephalus* (Brandes, 1888, *nec* Westrumb) Szidat, 1928. Syn. *Holostomum sphae-*

[2] Matériel brésilien déposé à l'Institut zoologique de Naples.

[3] Les Tetracotyle "*ichthyocystis*", "*ophiocystis*" et "*theriocystis*" [Lutz, 1928, p. 115-116; 1929, p. 129] évoluent en *Strigea* du type *Holostomum vaginatum* Brandes. Les parasites de *Cariama cristata* (L.) doivent correspondre à *Strigea ophiocystis* Lutz, 1928, p. 118 [cf. Lutz, 1929].

rocephalum Brandes, 1888, p. 65; 1890, p. 592-593, pl. XLI, fig. 20; e. p. Braun, 1892-93, p. 903; e. p. Viana, 1921, p. 118, 159, 166.171, 183, 190; *Strigea sphaerocephala* Lutz, 1928, p. 118 (*nec* Westrumb); *Apatemon sphaerocephalus* (Brandes, *nec* Westrumb) Szidat, 1928, p. 205, 208, 213; 1929, p. 730-732, fig. 25; Neveu-Lemaire, 1936, p. 219, 251. Hôtes: *Anas brasiliensis* Gm., *Cairina moschata* (L.). Collection: Mus. Wien. 251.

Apatemon graciliformis Szidat, 1928, p. 205, 208, 213; 1929, p. 730, fig. 24; Lutz, 1931, p. 341 (352); Neveu-Lemaire, 1936, p. 219. Hôte: *Cairina moschata* (L.). Collection: Mus. Wien. 251, 261.

Cardiocephalus brandesii Szidat, 1928, p. 205, 208, 213; 1929, p. 726-727, fig. 22. Syn. *Holostomum erraticum* Brandes, 1888, p. 63-64; 1890, p. 591, pl. XLI, fig. 3, 4 [*nec* Rudolphi, 1809]; Lühe, 1909, p. 163; Viana, 1921, p. 116, 159, 161, 180, 183, 190; *Holostoma erraticum* Railliet, 1895, p. 383; *Strigea bursigera* Linton, 1928, p. 30-33, pl. XI, fig. 68-72 [*nec* Brandes, 1888]. Hôtes: *Larus argentatus* Pont., *Larus atricilla* L., *Larus delawarensis* Ord., *Larus maculipennis* Licht., *Rhynchops nigra* L. Collection: U. S. N. M., 7951, 7952, 7953; Mus. Wien, 113, 213, 270; Mus. Berl., 1106.

Cardiocephalus physalis (Lutz, 1926) Dubois, 1937, p. 392. Syn. *Strigea physalis* Lutz, 1926, p. 175; 1928, p. 117; 1935, p. 162 (171). Hôte: *Spheniscus magellanicus* (Forster). Collection A. Lutz.

Cotylurus gallinulae (Lutz, 1928) Dubois, 1937, p. 392. Syn. *Strigea gallinulae* Lutz, 1928, p. 118, 120-121. Hôte: Oiseau de l'ordre des *Ralli*. Collection A. Lutz.

Cotylurus cornutus[1] (Rudolphi, 1809) Szidat, 1928, p. 205, 209, 214; 1929, p. 733-736, I, fig. 7 *a-c*, 13, 18, pl. VIII; II, fig. 26, 27. Syn. *Strigea tarda* (Steenstrup, 1842); Lutz, 1928, p. 118. Hôte: Canard sauvage. Collection A. Lutz.

Familia DIPLOSTOMIDAE Poirier, 1886.

Subfamilia Diplostominae Monticelli, 1888.

Subsubfamilia *Diplostomini* Dubois, 1936 a.

Diplostomum alarioides Dubois, 1937, p. 392. Hôte: *Lutra brasiliensis* Zimm. Collection: Mus. Wien. 566.

Hysteromorpha compacta (Lutz, 1928) Dubois, 1937, p. 393. Syn. *Alaria compacta* Lutz, 1928, p. 118, 120. Hôte: *Phalacrocorax olivaceus* (Humboldt) = *Carbo brasiliensis*. Collection: A. Lutz[2].

Lophosicyadiplostomum saturnium Dubois, 1936 a, p. 513. Hôte: *Pyroderus scutatus* (Shaw). Collection: Mus. Wien, 89.

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[1] Nous ne pouvons donner ici la liste des synonymes de cette espèce.

[2] Dans son étude sur l'ontogénie de *Hemistomum trilobum* (Rud.), Lutz (1931) ne mentionne pas "*Alaria compacta*", mais il écrit: "Durch Vergleichung der anderen Quellen habe ich mich überzeugt, dass von der Distanz der Fundorte abgesehen, kein Grund vorliegt, an der Identität der von mir in Rio de Janeiro gesammelten Species mit *H. trilobus* zu zweifeln, um so mehr, als es sich um nahe verwandte Wirte handelt. Das Vorkommen identischer oder höchst ähnlicher parasitischer Würmer in zwei entlegenen Weltteilen steht durchaus nicht vereinzelt da und es stimmt dann auch ihre Ontogenie überein, soweit wir diese kennen".

Lophosieyadiplostomum nephrocystis (Lutz, 1928) Dubois, 1937, p. 393. Syn. *Neodiplostomum nephrocystis* Lutz, 1928, p. 117; *Triplostomum nephrocystis* Lutz, 1928, p. 118-119. Hôte: Epervier rouge (Gavilán bermejo). Collection: A. Lutz.

Neodiplostomum (Neodiplostomum) bioralum Dubois, 1937, p. 394. Hôte: *Parabuteo unicinctus* (Temm.). Collection: Mus. Wien, 517.

Neodiplostomum branchiocystis Lutz, 1928, p. 117. Syn. *Triplostomum branchiocystis* Lutz, 1928, p. 119. Hôte: *Pitangus sulphuratus* (L.). Collection: A. Lutz.

Neodiplostomum (Neodiplostomum) conicum Dubois, 1937, p. 393-394. Hôtes: *Asio accipitrinus* (Pall.); *Syrnium hylophylum* (Temm.), *Accipiter pectoralis* (Bonap.). Collection: Mus. Wien, 527 (type), 96, 516.

Neodiplostomum (Neodiplostomum) ellipticum (Brandes, 1888) La Rue, 1926a, p. 15, 17; Dubois, 1932, p. 395; 1937, p. 393. Syn. *Hemistomum ellipticum* Brandes, 1888, p. 59-60; 1890, p. 585; Linstow, 1889, p. 29; Braun, 1892-93, p. 902; Krause, 1914, p. 186-191, fig. Y_1, Z_1, A_2, B_2, pl. VI, fig. 5; Viana, 1924, p. 115-116, 160, 168, 180, 182; *Corchogaster ellipticus* (Brandes) Lutz, 1928, p. 118, 119. Hôtes: *Crotophaga ani* L., *Crotophaga major* Gm., *Piaya cayana* L. Collections: Mus. Wien, 519 (type), 87, 529; coll. A. Lutz.

Neodiplostomum (Neodiplostomum) microcotyle Dubois, 1937, p. 394. Hôtes: *Hypomorphnus urubitinga* (Gm.), *Micrastur semitorquatus* (Vieill.). Collection: Mus. Wien, 511 (type), 516, 519.

Neodiplostomum (Neodiplostomum) rhamphasti Dubois, 1937, p. 394. Hôte: *Rhamphastos erythrorhynchus* Gm. Collection: Mus. Wien, 518.

Neodiplostomum (Neodiplostomum) travassosi Dubois, 1937, p. 394. Hôtes: *Scops cristatus* (Daud.), *Syrnium perspicillatum* (Lath.), *Strix* sp. Collection: Mus. Wien, 507, 530, 535 (type).

Species inquirendae: (*Conchogaster obesus*) Lutz, 1928, p. 117, 119. Hôte: *Phalacrocorax olivaceus* (Humboldt) = *Carbo brasiliensis*. Collection: A. Lutz.

Posthodiplostomum grande (Diesing, 1850) Dubois, 1936a, p. 513. Syn. *Diplostomum grande* Diesing, 1850, p. 307; 1855, p. 60, pl. I, fig. 1-12; 1858, p. 318; 1859, p. 424; Creplin, 1851, p. 286, 287; Leidy, 1858, p. 110; 1904, p. 111; Molin, 1861, p. 192; Linstow, 1878, p. 105, 141, 143; 1889, p. 52, Monticelli, 1888, p. 12; Brandes, 1888, p. 54-55, 1890, p. 581, pl. XXXIX, fig. 11; Braun, 1892-93, p. 582, 991; Pratt, 1902, p. 965; Nicoll, 1923, p. 171, 177; Viana, 1924, p. 121, 160, 166, 178, 182; *Diplostoma grande* (Diesing) Cobbold, 1860, p. 50, 51; *Hemistomum grande* (Diesing) Krause, 1914, p. 222-226, fig. A; *Neodiplostomum grande* (Diesing) La Rue, 1926a, p. 15; Dubois, 1932, p. 396; *Hemistomum macropterum* (étiquette, Mus. Wien) Brandes, 1888, p. 55; 1890, p. 576, 581. Hôtes: *Agamia agami* (Gm.), *Herodias egretta* (Wils.). Collection: Mus. Wien, 513, 573, 579.

Posthodiplostomum macrocotyle Dubois, 1937, p. 396. Hôte: *Rhynchops nigra* L. Collection: Mus. Wien, 513.

Posthodiplostomum microsicya Dubois, 1936a, p. 513. Hôte: *Botaurus pinnatus* (Wagler). Collection: Mus. Wien, 515 (type), 551.

Posthodiplostomum nanum Dubois, 1937, p. 396. Hôte: *Butorides virescens* (L.). Collection: Mus. Wien, 547.

Sphincterodiplostomum musculosum Dubois, 1936a, p. 513. Hôte: *Agamia agami* (Gm.). Collection: Mus. Wien, 579.

Tylodelphys americana (Dubois, 1936) Dubois, 1937, p. 395. Syn. *Prodiplostomum americanum* Dubois, 1936 a, p. 513. Hôtes: *Mycteria americana* L., *Tantalus loculator* L. Collection: Mus. Wien, 505, 510 (type).

Tylodelphys elongata (Lutz, 1928) Dubois, 1937, p. 395. Syn. *Alaria elongata* Lutz, 1928, p. 118, 120. Hôte: *Poliocephalus dominicus* (L.). Collection: A. Lutz.

Subsubfamilia *Crassiphialini* Dubois, 1936 a.

Uvulifer prosocotyle (Lutz, 1928) *mihi*. Syn. *Conchogaster prosocotyle* Lutz, 1928, p. 118, 120. *Crassiphiala prosocotyle* (Lutz) Dubois, 1937, p. 396. Hôte: *Ceryle torquata* L., Ceryle sp. Collections: Mus. Wien, 576; coll. A. Lutz.

Subfamilia Alariinae Hall et Wigdor, 1918.

Alaria (Alaria) alata[6] (Goeze, 1782) Hall & Wigdor, 1918, p. 228 [cf. observations de Diesing, 1850, p. 307-308 (matériel Natterer)] et Lutz, 1933, p. 35, 40 (52, 57), pl. V, fig. 1-4. Hôtes: *Canis (Thous) azarae* (Wied.), *Canis familiaris* L. Collection A. Lutz.

Alaria (Paralaria) clathrata (e. p. Diesing, 1850) La Rue, 1926 a, p. 16; 1926 b, p. 277; Dubois, 1932, p. 391; 1935, p. 166, 168-172, fig. 13, 15, 17, 19. Syn. *Hemistomum clathratum* e. p. Diesing, 1850, p. 308; 1855, p. 61, pl. I, fig. 13 et 15; 1858, p. 318-319; Creplin, 1851, p. 274; Linstow, 1878, p. 10; Brandes, 1888, p. 60-61; 1890, p. 587-588, pl. XL, fig. 7, 9, 11, 12, 13; Braun, 1892-93, p. 569, 582, 599, 699, 902; Benham, 1901, p. 68; Pratt, 1902, p. 978; Wolf, 1903, p. 605; Krause, 1911, p. 191-198, 233, fig. C_2-G_2, pl. VI, fig. 7; Viana, 1921, p. 103-104, 160, 161, 176, 182; *Haemastomum clathratum* (Diesing) Rosseter, 1909, p. 389; *Hemistoma clathrata* (Diesing) Cobbold, 1861, p. 17. Hôte: *Lutra brasiliensis* Zimm. Collection: Mus. Wien.

Alaria (Paralaria) pseudoclathrata (Krause, 1911) La Rue, 1926 a, p. 16; 1926 b, p. 277; Dubois, 1932, p. 391; 1935, p. 166, 168-172, fig. 14, 16, 18, 20. Syn. *Hemistomum pseudoclathratum* Krause, 1911, p. 198-201, 233, fig. H_2-P_2, pl. VI, fig. 6; *Hemistomum clathratum* (e. p. Diesing) e. p. Brandes, 1890, pl. XL, fig. 6, 8, 10 („Jugendform"). Hôte: *Lutra brasiliensis* Zimm. Collection: Mus. Wien.

Podospathalium pedatum (Diesing, 1850) Dubois, 1932, p. 397; 1935, p. 147-158, fig. 1-9; 1936 a, p. 511. Syn. *Hemistomum pedatum* Diesing, 1850, p. 309; 1855, p. 61-62, pl. I, fig. 19-21; 1858, p. 319; Creplin, 1851, p. 275; Linstow, 1878, p. 61, 65; Brandes, 1888, p. 61; 1890, p. 588, pl. XL, fig. 11; Braun, 1892-93, p. 581, 880, 902; Krause, 1911, p. 229-231, fig. C_3; Viana, 1921, p. 140-141, 160, 163, 182, 187; Sprehn, 1932, p. 352; *Hemistoma pedatum* (Diesing) Cobbold, 1861, p. 17-18. Hôtes: *Didelphis marsupialis* L. (= *D. cancrivorus* Gm.), *Metachirus nudicaudata* E. Geoff. Collection: Mus. Wien, 550.

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[6] Nous ne pouvons donner ici la liste des synonymes de cette espèce.

Familia PROTERODIPLOSTOMIDAE Dubois, 1936 a.

Supersubfamilia PROTERODIPLOSTOMIDI Dubois, 1936 a.

Subfamilia Proterodiplostominae Dubois, 1936 a.

Mesodiplostomum gladiolum Dubois, 1936 a, p. 514; 1936 b, p. 21-25, fig. 4 et 5. Hôte: *Melanosuchus niger* (Spix) (= « Crocodilus Jacaré guaçú »). Collection: Mus. Wien, 100 (type), 110, 91.

Proterodiplostomum longum (Brandes, 1888) Dubois, 1936 a, p. 513; 1936 b, p. 14-18, 21, fig. 1 et 2. Syn. *Diplostomum longum* Brandes, 1888, p. 25, 51, 55, 57, 61; 1890, p. 584, pl. XXXIX, fig. 1-9; Linstow, 1889, p. 62; Braun, 1892-93, p. 569, 581, 582, 585, 672, 991; Benham, 1901, p. 68; Pratt, 1902, p. 978; Wolf, 1903, p. 605; Rosseter, 1909, p. 389; Viana, 1924, p. 129, 142, 169, 171, 178, 184; *Crocodilicola longus* (Brandes) Poche, 1925, p. 191; *Neodiplostomum longum* (Brandes), La Rue, 1926 a, p. 15; Dubois, 1932, p. 396; Dollfus, 1935, p. 638. Hôtes: « Crocodilus coroa », *Melanosuchus niger* (Spix) (= « Crocodilus Jacaré guaçú »). Collection: Mus. Wien, 107, 110, 112, 113.

Proterodiplostomum tumidulum Dubois, 1936 a, p. 513; 1936 b, p. 18-21, fig. 3. Hôte: *Caiman crocodilus* (L.) (= *Crocodilus sclerops* Schneid. Collection: Mus. Wien, 591 (type), 523.

Species inquirenda: (Diplostome *medusae* Dubois, 1936 b, p. 75-78, fig. 42 et 43. Hôte: *Caiman crocodilus* (L.) (= *Crocodilus sclerops* Schneid. Collection: Mus. Wien, 591 (type), 523.

Subfamilia Polycotylinae Monticelli, 1888.

Cystodiplostomum hollyi Dubois, 1936 a, p. 514; 1936 b, p. 34-38, fig. 10 et 11. Hôtes: *Caiman crocodilus* (L.) (= *Crocodilus sclerops* Schneid. *Caiman latirostris* (Daud.). Collection: Mus. Wien, 104 (type), 103.

Herpetodiplostomum caïmancola (Dollfus, 1935) Dubois, 1936 a, p. 514; 1936 b, p. 38-41, 45, fig. 12-15. Syn. *Crocodilicola caïmancola* Dollfus, 1935, p. 638-641, fig. 1-4. Hôtes: *Caiman crocodilus* (L.) (= *Crocodilus sclerops* Schneid., *Caiman latirostris* (Daud.), ? *Melanosuchus niger* (Spix) (= « Crocodilus Jacaré guaçú »). Collection: Mus. Wien, 104, 110, 118; coll. Dollfus, Paris.

Herpetodiplostomum testudinis Dubois, 1936 a, p. 514; 1936 b, p. 41-45, fig. 16-18. Hôtes: Tortues. Collection: Mus. Wien, 114 (type), 111.

Paradiplostomum abbreviatum (Brandes, 1888) La Rue, 1926 a, p. 12, 15; 1926 b, p. 277; Haitsma, 1930, p. 117; Dubois, 1932, p. 396; 1936 b, p. 45-49, fig. 19 et 20; Dollfus, 1935, p. 638. Syn. *Diplostomum abbreviatum* Brandes, 1888, p. 55; 1890, p. 581-582, pl. XXXIX, fig. 15-17; Linstow, 1889, p. 62; Braun, 1892-93, p. 991; Odhner, 1913, p. 312, 315; Viana, 1924, p. 96, 142, 160, 171, 174, 178; *Crocodilicola abbreviatus* (Brandes) Poche, 1925, p. 191. Hôte: *Caiman crocodilus* (L.) (= *Crocodilus sclerops* Schneid. Collection: Mus. Wien, 591.

Prolecithodiplostomum cavum Dubois, 1936 a, p. 514, 1936 b, p. 30-34, fig. 8 et 9. Hôte: *Caiman crocodilus* (L.) (= *Crocodilus sclerops* Schneid. Collection: Mus. Wien, 104.

Prolecithodiplostomum constrictum Dubois, 1936 a, p. 511; 1936 b, p. 25-30, 31; fig. 6 et 7. Hôte: *Caiman crocodilus* (L.) = (*Crocodilus sclerops* Schneid. Collection: Mus. Wien, 106 (type), 104, 98, 99, 101, 509.

Supersubfamilia *OPHIODIPLOSTOMIDI* Dubois, 1936 a.

Heterodiplostomum lanceolatum Dubois, 1936 a, p. 515; 1936 b, p. 57-61, fig. 26-28. Hôte: *Coluber* sp. Collection: Mus. Wien, 102 (type), 520.

Ophiodiplostomum spectabile Dubois, 1936 a, p. 511; 1936 b, p. 50-53, fig. 21-23. Hôte: *Drymobius bifossatus* (Raddi) (= *Coluber pantherinus* (Dum. & Bib.)). Collections: Mus. Wien, 120 (type), 109, 525; Mus. Berl., 1105, 2.196.

Petalodiplostomum ancyloides Dubois, 1936 a, p. 511; 1936 b, p. 54-56, fig. 24 et 25. Hôte: *Coluber* sp. Collection: Mus. Wien, 97.

Familia CYATHOCOTYLIDAE Poche, 1925.

Subfamilia Prohemistominae Lutz, 1935.

Mesostephanus fajardensis (Price, 1931) Lutz, 1935, p. 161, 167 (177, 180), pl. II, fig. 5; Szidat, 1936, p. 291, fig. 1*b* (erratum «*appendiculatoides*»), 296. Syn. *Prohemistomum fajardensis* Price, 1931, p. 1-5, 6, pl. 1, fig. 6; Dubois, 1935, p. 582; Szidat, 1936, p. 287; *Mesostephanus prolificus* Lutz, 1935, p. 160, 167 (173, 180). Hôtes: *Sula brasiliensis* Spix, *Sula leucogaster* (Bodd.). Collection: U. S. N. M., 8696 (type), 8697; coll. A. Lutz.

Mesostephanus infecundus Lutz, 1935, p. 160, 167 (173, 180); Szidat, 1936, p. 296. Hôte: *Fregata aquila* (L.). Collection A. Lutz.

Mesostephanus odhneri (Travassos, 1924) Lutz, 1935, p. 167, 168 (180), pl. I, fig. 5 *a*, 8; Szidat, 1936, p. 291, fig. 1 *d*, 296. Syn. *Prohemistomum odhneri* Travassos, 1924, p. 835-838, fig. 1-3; Mathias, 1925, p. 14; Joyeux et Baer, 1934, p. 209-211; Lutz, 1935, p. 160, 161, 163, 167 (172, 173, 175, 180); Dubois, 1935, p. 582; Szidat, 1936, p. 287, 290. Hôte: *Nyctanassa violacea* (L.) (expérimental).

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Planche 1

Fig. 1 — *Neodiplostomum travassosi* Dubois, 1937, de *Syrnium perspicillatum* Lath.). Mus. Wien, 535 (vue ventrale).

Fig. 2 — *Neodiplostomum conicum* Dubois, 1937, de *Syrnium hylophylum* Temm.). Mus. Wien, 527 (vue ventrale).

Fig. 3 — *Diplostomum alarioides* Dubois, 1937, de *Lutra brasiliensis* Zimm. Mus. Wien, 566 (vue latéro-ventrale).

Fig. 4 — *Posthodiplostomum macrocotyle* Dubois, 1937, de *Rhynchops nigra* L. Mus. Wien, 543 (vue ventrale).



Dubois: Strigéidés du Brésil et du Venezuela.

Report on a Collection of some Chinese Cyathocotylidae

(Trematoda, Strigeoidea)

Prof. Ernest Carroll Faust and Chung-Chang Tang

Parasitology Laboratory, Department of Tropical Medicine, Tulane University of Louisiana, New Orleans, La., U. S. A. and the Fukien Science Institute, Foochow, China.

[With 2 plates]

INTRODUCTION

Comparable to the progress made in our knowledge of the life cycles and relationships of the blood flukes (*Schistosomatoidea*) during the second decade of the present century has been the accumulation of data on the group of the *Strigeoidea* during the past 15 years. Most important of all these studies has been the discovery that these two superfamily groups, which have mature worms (maritae) so fundamentally different in appearance, are, in reality, fundamentally related. The work of Cort, Faust, Sewell and other investigators demonstrated that there was close relationship between the apharyngeal fork-tailed cercariae, which were found to develop into schistosomatoid flukes, and the pharyngeal fork-tailed cercariae. Following the earlier experimental studies of Lutz (1921), Ruszkowski (1922) and Mathias (1922), the investigations of Szidat (1923-1929) furnished conclusive proof that the latter type of cercariae underwent a profound metamorphosis during an encysted metacercarial stage in invertebrates or lower vertebrate hosts and that these metacercariae, when ingested by higher vertebrates, developed into mature strigeoid species. Several previous workers had logically related these metacercariae (tetracotyles, diplostomula, etc.) to their adult worms, and a few feeding experiments had confirmed this hypothesis, but the demonstration of the transformation from the cercaria to the metacercaria constituted the fundamental proof of the hypothecated link in the life cycle of this superfamily group.

Interestingly enough, the elucidation of this problem by various groups of workers has been confined almost exclusively to species belonging to the families *Strigeidae* Railliet, 1919 (*sensu stricto*) and *Diplostomidae* Poirier, 1886 (syn. *Alariidae* Tubangui, 1922), while practically no attention has been given to members of the family *Cyathocotylidae* Poche, 1926. It has been assumed that the number of species of this latter family is quite small, an assumption which is probably correct when the other family groups of the *Strigeoidea* are considered. Nevertheless, the recent studies of Gogate (1932), Szidat (1933), Wisniewski (1934), Price (1934), Mathias (1935), Lutz (1935) and others indicate that there are at least six known genera of *Cyathocotylidae*, with as many as 20 or more known species.

The type species of the genus *Cyathocotyle* was described by Mühling, in 1896. A second species, *C. fraterna*, was described by Odhner, in 1902. Other species, reported as belonging to this genus, are as follows: *orientalis* (Faust,

1921); *melanittae* (Yamaguti, 1934); *teganuma* (Ishii, 1935); *fusa* (Ishii & Matsuoka, 1935); and *gravieri* (Mathias, 1935).

In 1913, Odhner created the genus *Prohemistomum* for the species *vivax* (Sonsino, 1892), syn. *spinulosum* Odhner, 1913. To this genus have been added: *appendiculatum* (Ciurea, 1916); *ovatus* (Katsurada, 1914, *fide* Ciurea, 1916); *industrium* Tubangui, 1922; *odhneri* (Travassos, 1924); *joyeuxi* (Hughes, 1929; Joyeux & Baer, 1934); *serpentum* (Gogate, 1932); *fajardensis* (Price, 1934); *appendiculatoides* (Price, 1934) and *syriacum* (Dubois, 1935). In 1933, Szidat created the genus *Linstowiella* for the species *viviparae*, and the following year Wisniewski referred to this genus the adult *Cyathocotyle orientalis* (Faust, 1921). In 1935, Lutz created three new genera, to receive certain species previously placed in *Prohemistomum* and two other species newly described by him. The species *industrium* (Tubangui, 1922) was transferred by Lutz to the new genus *Prosostephanus*; the species *serpentum* (Gogate, 1932), to the new genus *Gogatea*; the species *appendiculatum* (Ciurea, 1916), *fajardensis* (Price, 1934), *appendiculatoides* (Price, 1934) and possibly *odhneri* (Travassos, 1924), as well as *prolificus* (Lutz, 1935) and *infecundus* (Lutz, 1935), to the new genus *Mesostephanus*.

In 1936, Dubois proposed an elaborate classification of strigeoid families and genera, based essentially on the Poche system (1926). This classification concerns us in this study only in so far as the cyathocotylid species are involved. The family *Cyathocotylidae* Poche, 1925, with two subfamilies, *Cyathocotylinae* Mühling, 1898, and *Prohemistominae* Lutz, 1935, is combined with the family *Brauninidae* Bosma, 1931, to form the new superfamily *Cyathocotylides* *(sic)*, which is co-ranked with the superfamily *Strigeides* *(sic)*, under the supersuperfamily *Strigeida* Poche, 1926 (syn. *Strigeoidea* Railliet, 1919).

SOURCES AND AMOUNT OF PRESENT COLLECTION

The material which we have available for study consists of the following specimens:

1. One vial of several specimens obtained from the small intestine of a domesticated mallard duck (*Anas boschas*), from Peiping, China, Nov. 12, 1921.
2. One vial of four specimens obtained from the intestine of a domestic goose (*Anser* sp.), from Foochow, China, March 21, 1935.
3. One vial of four specimens obtained from the intestine of a domestic chicken (*Gallus gallus domesticus*), from Foochow, China, July, 1936.
4. One vial of 16 specimens obtained from the intestine of the bamboo chicken (*Bambusicola thoracica*), from Foochow, China, December, 1934.
5. One vial of five specimens obtained at necropsy from the intestine of a badger (*Meles leptorhynchus*), from Foochow, China, June 14, 1935.
6. One vial of several specimens obtained at necropsy from the intestine of the palm cat (*Paguma larvata*), from Foochow, China, March, 1935.
7. One vial of several specimens obtained at necropsy from the intestine of a marten (?) (*Mustela* sp.), from Foochow, China, Feb. 14, 1935.

PRESENTATION OF DATA

Cyathocotyle szidatiana n. sp.

(Species named in honor of Professor L. Szidat)

HOST: — *Anas boschas* (natural infection).
LOCALITY: — Peiping, China.
DATE: — Nov. 12, 1921.

A considerable number of these minute flukes was removed at autopsy of the host. They vary strikingly in their contour and size but average 0.588-0.622 mm. in length, 0.150 mm. in breadth and 0.172 mm. in greatest depth, when fixed in steaming 2 per cent formaldehyde. In general, their appearance is more like that of an ascidian than a trematode. In ventral view (Pl. 1, fig. 1) the organism is broadly ovate, but in lateral view (Pl. 1, fig. 2) it has more the outline of a mitten with a short thumb and no individual fingers.

The oral sucker, which averages 77 microns in length by 88 microns in width, is terminal on the «thumb-like» extension of the organism; the smaller, distinctly muscular acetabulum (50-66 microns by 33 microns) is situated on a slight elevation some little distance behind the bifurcation of the intestine, just in front of the anterior rim of the holdfast organ. This latter organ is a relatively thick-walled, cylindrical, ventral extension of the body, measuring 0.270 mm. in diameter and possessing a deep concavity. On the inner aspect of its rim there are approximately six separate sucking petals. At the posterior extremity of the worm there is a crater-like invagination, the genital atrium.

Within the oral sucker there is a slightly obovate-to-pyriform pharynx, measuring 66 microns long by 50 microns broad, and an extremely short esophagus, which bifurcates to form a pair of broadly bowed ceca, which, in turn, terminate blindly some little distance in front of the genital atrium. The excretory system has not been studied.

The primary male genital organs consist of two large subspherical testes (0.180 mm. by 0.160 mm.), lying in tandem on the left side of the body in a slightly oblique plane. The cirrus apparatus consists of an elongated, retort-shaped envelope, the cirrus sac, which is at times considerably contracted and is bent on itself in its posterior half. Within the head of the cirrus sac is the seminal vesicle, following which the male genital tube narrows to pass through the region of the prostate glands. In its posterior third there is a relatively distinct, muscular penis, which is fashioned as a hollow capillary tubule, capable of considerable exsertion from the sac. The subspherical ovary (88 microns in diameter) is situated in the midplane of the anterior testis on the right side of the organism. The vitellaria are relatively small, distinct, ovoidal to polygonal follicles, with densely granular contents. They occupy the lateral fields all the way from the oral sucker to the posterior end of the body (Pl. 1, fig. 1), and, at times, may encroach on the median longitudinal portion of the worm, dorsal to the anterior testis. The exact positions of the seminal receptacle and oötype have not been determined, although they probably lie between the ovary and anterior testis.

Only a few eggs (one to five) have been seen in each worm. They are

broadly ovoidal, operculate, immature, and measure approximately 143 by 86 microns. They are discharged through the uterine pore, which opens into the genital atrium to the right side of the cirrus organ. These eggs are considerably larger than those described for *C. prussica*, *C. fusa* and *C. gravieri*, and are somewhat larger and narrower than those described for *C. fraterna*.

Linstowiella (?) lutzi n. sp.

(Species named in honor of Professor A. Lutz)

HOSTS: — (1) *Gallus gallus domesticus* (type), (2) *Anser* sp.

LOCALITY: — Foochow, Fukien Province, China.

DATES: — (1) July, 1936; (2) March 21, 1935.

The specimens from the two hosts are specifically indistinguishable. From the ventral aspect, they are obovate-quadrate in contour (Pl. 1, fig. 3), with a large ventral concavity and a dorsal convexity. The body measurements, range from 1.4 to 1.7 mm. in length by 1.1 to 1.2 mm. in breadth. From ventral view the holdfast organ is not readily seen. The acetabulum is lacking. The oral sucker is urn-shaped, measures about 137 microns in greatest diameter and 100 microns in depth and is antero-ventral in position The pharynx has a longitudinal measurement of about 82 microns and a transverse diameter of 96 microns. The esophagus divides almost immediately behind the pharynx to form the two ceca, which end blindly a short distance behind the posterior border of the testes.

The testes are ovoidal to ovoidal-elongated organs, situated on either side, behind the middle transverse plane (Pl. 1, fig. 3) or in a distinctly oblique plane in the middle third of the body. The left testis is apparently always somewhat anterior to the right testis. On the left side of the body is the cirrus sac. It consists of a slightly curved, elongated, anterior portion, which contains an anterior «cap» of tightly packed spermatozoa and a more median highly-coiled seminal tubule, a relatively short, more posterior region, surrounded by prostate glands, and a long narrowed region containing the penial organ, which may be exserted some distance through the male genital pore and genital atrium. (See Pl. 2, fig. 1). The ovary is a small, ovoidal organ, some distance anterior to the right testis. A short oviduct leads directly to the oötype. No seminal receptacle has been distinguished. The vitelline follicles are large, distinct, densely granular bodies, oval-elongated to polygonal in contour; they may be confined entirely to the lateral fields, but at times encroach on the median longitudinal field. They extend from the bifurcation of the gut (or slightly anterior to this plane) as far posteriad as the subcaudal region. The distinctly muscular uterus is a relatively short, slightly coiled tubule, for the most part traversing the mid-plane to open posteriad into the genital atrium on the right side of the cirrus organ. The uterine eggs number up to 36, are typically strigeoid in type and measure 122-129 microns by 80-107 microns.

Linstowiella (?) bambusicolae n. sp.

HOST: — *Bambusicola thoracica.*
LOCALITY: — Foochow, Fukien Province, China.
DATE: — December, 1934.

This fluke (Pl. 1. fig. 1) is quite symmetrically oval from the ventral aspect, with a large concavity of circular contour sculptured out of the venter and with a somewhat convex dorsum. It has an average length of about 1 mm. and an average breadth of about 0.7 mm. The diameter of the ventral concavity is about 0.58 mm. Arising from its depth is the large holdfast organ, whose diameter and elevation from the concavity vary considerably, due to muscular elements, especially in its rim. There is no acetabulum.

The oral sucker is circular in outline, has a diameter of about 112 microns and opens ventro-anteriad. Immediately within it there is a subspherical pharynx with a diameter of about 75 microns. The esophagus, which has a length of about 100 microns, forks just anterior to the rim of the central concavity. The ceca terminate blindly towards the posterior end of the concavity.

In the specimens studied the two subspherical testes, about 130 microns in diameter, are both situated on the left side of the body; the anterior one lies meso-anteriad to the posterior one. The conspicuous cirrus sac has a large, rounded anterior end in the region of the anterior testis and begins to narrow appreciably at the level of the posterior testis. Behind this region it bends slightly and proceeds as a narrow tubule to the posterior end of the worm, where it opens into a small, inconspicuous genital atrium. The anterior third of the cirrus sac is occupied by the slightly torted, swollen seminal vesicle, which then narrows considerably as it coils through the middle portion of the cirrus sac, passing *en route* through a short length of prostate glands. In the posterior two-fifths of the sac there is a stiff, capillary penial organ, which is somewhat curved and is capable of exsertion for a distance of at least 150 microns outside the genital atrium. The ovary is a small subspherical organ of about 75 microns diameter, lying in the anterior right quadrant dorsal to the circular concavity; it is so completely masked by the dense granules of the vitelline glands that it is hardly visible in *in toto* mounts. A short distance meso-posteriad is the oötype. The large ovoidal-polygonal vitellaria pack the dorsal portion of the worm from the region of the esophagus to the subdistal region. They encroach considerably on the middle fields, lying at times over the testes, cirrus sac and uterus. The uterus is usually confined to the median longitudinal third of the fluke, from the head of the cirrus sac to the genital atrium, in which case it contains at most only a few eggs. At times, however, as many as 25 uterine eggs may be present, when the uterus is found to bend far out into the lateral fields. The typical strigeoid eggs average 128 by 79 microns.

Travassosella pagumae n. g., n. sp.

(Genus named in honor of Professor L. Travassos)

HOSTS: — (1) *Paguma larvata* (type), (2) *Mustela* sp.
LOCALITY: — Foochow, Fukien Province, China.

DATES: — (1) March 1935; (2) February 14, 1935.

These flukes (Pl. 2, fig. 2), which are assigned to this new genus and species, are typically elongated-obovate in contour, when viewed from the ventral aspect, although some fixed specimens are considerably broader. An average specimen measures 1.6 mm. in length by 1.0 mm. in greatest breadth, which is somewhat anterior to the equatorial plane. In such a specimen the ventral concavity is oval in outline, measures 117 microns in length by 80 microns in breadth, and may have an elevated holdfast plug nearly filling the concavity or, in case the holdfast organ is depressed, may only have its rim lined with a large muscular inner border. The dorsum of the fluke is considerably arched. An acetabulum is lacking.

The oral sucker is small, being about 116 microns in diameter, is closely appressed to the body wall, is subterminal and opens ventro-anteriad. The subspherical pharynx has a diameter of about 75 microns. An esophagus is apparently lacking; the intestinal ceca originate directly from the posterior end of the pharynx and extend within the ventral concavity to the posterior border of the depression, not extending into the conoidal posterior portion of the worm.

The two large conspicuous testes are each about 55 microns broad and 50 microns long. They lie one in front of the other in the center of, and nearly filling, the ventral concavity. The cirrus sac is a long straight tube, with a total length of somewhat more than 1 millimeter. The anterior end is broad and rounded and is filled with a slightly twisted seminal vesicle. The middle third is slightly smaller in diameter and contains a narrowed tubule which traverses a long prostate gland. The terminal third is more narrowed and surrounds the penial organ, which is not usually exserted outside the conical invagination of the genital atrium. The ovary is small and spherical, measuring only about 130 microns in diameter. It lies below the postero-dextral portion of the anterior testis. Nearly is the smaller seminal receptacle, and between these two organs lies the oötype. The vitellaria are moderately granular, ovate follicles, distributed in fan-shaped arrangement within the limits of the ventral concavity of the worm, but not encroaching conspicuously on the medial longitudinal field. The uterus arises from the anterior border of the oötype, proceeds as a slightly undulant tubule antero-mesad towards the anterior border of the anterior testis, then bends backwards and, as a distinctly coiled tubule, proceeds towards the female genital pore, which lies to the right of the male pore.

The eggs are typically strigeoid, are relatively few, and measure 133-143 microns in length by 98-102 microns in transverse diameter.

Although fixed specimens of *Travassosella pagumae* have considerable inconstancy of size, contour and position of their several organs, the following characters are quite constant:

(1) the tandem arrangement of unusually large testes;
(2) the shape, size and position of the small ovary;
(3) the disposition of the vitellaria;
(4) the shape, size and position of the cirrus sac and the length of the prostate glands;
(5) the size and shape of the eggs, and
(6) the absence of an acetabulum.

While these flukes are more nearly related to species of *Linstowiella* than to other described genera of the *Cyathocotylidae*, they vary more than specifically and require a new generic name. The genus *Travassosella* is designated as monotypie.

Prosostephanus parvoviparus n. sp.

HOST: — *Meles leptorhynchus.*
LOCALITY: — Foochow, Fukien Province, China.
DATE: — June 14, 1935.

From their lateral aspect these worms (Pl. 2, fig. 3) somewhat resemble a Dutch shoe lacking a heel. They are irregularly obovate and have a distinct ventral concavity, which, however, is confined to the anterior two-fifths of the worm. The specimens studied range in length from 1.68 to 2.0 mm., in breadth from 0.91 to 1.04 mm., and in greatest depth from 0.60 to 0.75 mm. On the type and paratype specimens, a small acetabulum has been observed, median in position at about the junction of the second and third sevenths of the body. It is provided with practically no muscle elements, and its constituent cells appear to be semi-glandular. It has a diameter of about 100 microns. The holdfast organ, which is situated between the acetabulum and the anterior border of the posterior testis, is barely visible as a somewhat dense, raised structure, relatively non-muscular, and partially glandular in its structure.

The oral sucker, which has a diameter of 160 microns, surmounts the anterior extremity of the fluke. Immediately behind it there is a spherical pharynx, with a trans-section of 100 microns. The inconspicuous esophagus divides immediately to form the two long ceca, which end at the beginning of the distal fifth of the body.

The two large, elongate-ovoidal testes are situated one behind the other in the posterior half of the median longitudinal plane. They vary considerably in size and shape. The cirrus sac is long, complexly built, and is usually twisted upon itself. It may extend forward as far as the anterior border of the anterior testis, or it may extend only to the middle of this organ. In its anterior third the cirrus sac is filled with the seminal receptacle, which is swollen in its anterior portion and tubular more distally. There is little or no evidence that this tubule coils on itself within the sac, although it bends as the entire sac is twisted. Along the third and fourth fifths of the sac the tubule traverses a long region of prostate gland cells and terminates as a relatively short capillary penial organ, within the relatively unconstricted distal end of the cirrus sac. The genital atrium is a small, inconspicuous depression at the posterior end of the worm.

The ovary is a minute organ situated in the angle between the two testes on their ventral aspect. On its left is a small seminal receptacle. Postero-ventro-sinistral to the ovary is the oötype, surrounded by Mehlis glands. The oviduct proceeds somewhat antero-mesad from the medial aspect of the ovary, then bends back on itself as it proceeds postero-sinistrad into the clump of Mehlis glands. Within the glands the tubule loops upon itself for more than 360 degrees and then emerges on the left side as the inner uterine tubule. The uterus

now runs over to the left side of the median longitudinal field and then bends antero-dextrad. In the transverse plane of the acetabulum the uterus loops back upon itself and, upon reaching the middle length of the cirrus sac, proceeds backwards to the genital atrium. Eggs were found in only one of the five specimens. One of these eggs, situated at the inner end of the uterus, was thick-walled and extremely small. The two other eggs, seen near the anterior loop of the uterus, appeared to be normal in size and shape, although they were small for strigeoid eggs. The larger one of these measured 97 by 57 microns, as compared with 130-146 by 89-97 microns for the eggs of *Prosostephanus industrius* (Tubangui, 1922) Lutz, 1935, the type species of the genus.

DISCUSSION

A study of this group of five new species of *Cyathocotylidae* adds considerable information to our knowledge and conception of this family group.

With *Cyathocotyle szidatiana*, there are now apparently five valid species of this genus, which, among other characters, possesses a small, distinctly muscular acetabulum between the oral sucker and the holdfast organ, and never residing within the ventral concavity of the organism. These species are: *C. prussica* Mühling, 1896; *C. fraterna* Odhner, 1902; *C. fusa* Ishii and Matsuoka, 1935, and *C. gravieri* Mathias, 1935, in addition to the presently described species. The experimental work of Mathias (l. c.) and Ishii and Matsuoka (l. c.) indicates that the usual life cycle of members of this genus probably involves the following consecutive hosts: a fresh-water snail, a fresh-water fish and a piscivorous bird.

The species *parvoviparus* fits readily into the genus *Prosostephanus* as designated and defined by Lutz (1935) and, with *P. industrius*, justifies the creation of the genus. In both species the acetabulum is vestigial, lies within the ventral concavity just anterior to the holdfast organ («clinging plug» of Tubangui) and is difficult to demonstrate in *in toto* mounts.

No new species are added to the genus *Prohemistomum* Odhner, 1913 emend. Lutz, 1935; to *Mesostephanus* Lutz, 1935, or to *Gogatea*, Lutz, 1935.

The species *lutzi* and *L. bambusicolae* are non-acetabular forms, which add important data to our knowledge of adult cyathocotylids developing unquestionably from anacetabular fork-tailed cercariae through a *Prohemistomulum* type of metacercaria. These are believed to be the first described adults of this group. They are generically characterized by having an especially large, bulbous seminal vesicle, a very short prostate region and a very long capillary penial organ. They are provisionally placed in the genus *Linstowiella*, but, should the adult of the type species, *L. viviparae*, prove to have other characters not common to these two species, the latter will have to be removed to a new genus. Szidat (1933) and Wisniewski (1934) have correctly removed the species *orientalis* Faust, 1921 (adult specimen) from the genus *Cyathocotyle*. This species is closely related to both *lutzi* and *bambusicolae*, as are also *melanittae* Yamaguti, 1934, and *teganuma* Ishii, 1935, both of which must also be removed from the genus *Cyathocotyle*, since they lack an acetabulum. All of these species, placed by us in the genus *Linstowiella*, with the reservations above indicated, probably have a life cycle involving consecutively a fresh-water snail, a fresh-water fish and a piscivorous bird.

The species *pagumae*, obtained from the intestine of two different species of piscivorous mammals, cannot be included in the previous group of anacetabular strigeoid flukes, because of several points in its internal anatomy which differ generically from those species. Especial attention is directed to the unusual length of the cirrus sac occupied by the prostate gland complex. When the life cycle of *Travassosella pagumae* is elucidated, it will, no doubt, be found to include an anacetabular fork-tailed cercaria and to involve successively a fresh-water snail, a fresh-water fish and a piscivorous mammal.

There is considerable evidence that several of these cyathocotylid species, particularly those without a well-developed acetabulum, are only ephemeral residents in their definitive hosts. Possibly this is due to an evolutionary trend in this group, with gradual loss of sufficient adhesive organs to maintain attachment to the intestinal epithelium of these hosts.

CONCLUSIONS AND SUMMARY

1. Five new species of cyathocotylid flukes, obtained from birds and mammals in China, are described.
2. *Cyathocothyle szidatiana* n. sp., from a Peiping domestic duck, constitutes a fifth valid species of this genus, which is characterized by the possession of a muscular acetabulum between the oral sucker and the much larger, deeply excavated holdfast organ.
3. The species *lutzi* n. sp., and *bambusicolae* n. sp., the former obtained at Foochow, Fukien, from a domestic fowl and a domestic goose, the latter from *Bambusicola thoracica*, are anacetabular cyathocotylids, which, together with the species *orientalis* Faust, 1921; *melanittae* Yamaguti, 1931; *teganuma* Ishii, 1935, are provisionally referred to the genus *Linstowiella* Szidat, 1933. However, should the adult *L. viviparae*, type of the genus, prove to possess characters more than specifically different from this closely related group of species, a new genus will be required for their reception.
4. *Travassosella pagumae* n. g., n. sp., from *Paguma larvata* and *Mustela* sp., is an anacetabular cyathocotylid differing generically as well as specifically from previously described anacetabular cyathocotylids.
5. *Prosostephanus parvoviparus* n. sp., from *Meles leptorhynchus*, Foochow, constitutes a second species of this genus to be described. Like the type species, *P. industrius* (Tubangui, 1922), *P. parvoviparus* has a small, inconspicuous, relatively non-muscular acetabulum within the ventral adhesive disc just anterior to the "clinging plug".
6. It seems probable that all cyathocotylids have a similar life cycle: Anacetabular fork-tailed cercariae, developed in fresh-water molluscs, emerge and invade the tissues of fresh-water fishes, where they become encysted and undergo a metamorphosis into a *Prohemistomulum* type of metacercariae. When fishes infected with these metacercariae are ingested by reptiles (genus *Gogatea*), birds (genera *Cyathocotyle*, *Prohemistomum pro parte*, *Mesostephanus*, *Linstowiella*), or mammals (*Prohemistomum pro parte*, *Prosostephanus*, *Travassosella*), they develop into adult worms in the intestines of these, their definitive hosts.

POSTSCRIPT

After the manuscript of this paper had been sent to the editorial committee for the Travassos Memorial Volume, the senior author first had an opportunity to read the valuable study by Szidat (1936, Zeitsch. f. Parasitenkde., **8** : 303-316), on the species of *Cyathocotylidae* recovered from terns (*Sterna hirundo* and *S. paradisea*) from the vicinity of Rossiten, Kurisches Haf, together with a comprehensive consideration of the subfamilies and genera of this family group. In Szidat's study several new species were referred to previously described genera, while others were placed in new genera. None of the newly described species and none of the genera proposed by the present writers are identical with Professor Szidat's new species and genera. However, the publication of data on the adult *Linstowiella viviparae* will probably require that the species *lutzi* and *bambusicolae*, described by us *(vide supra)*, be placed in a new genus, closely related to, but distinct from, both *Linstowiella* and *Paracyathocotyle*. In our opinion, the latter genus, erected by Szidat (l. c.) for the reception of the species *orientalis* Faust, 1921, and *melanittae* Yamaguti, 1934, is more closely related to the genera in the subfamily *Prohemistominae* Lutz, 1935, than to those belonging to the subfamily *Cyathocotylinae* Mühling, 1896 *(sensu stricto)*. — E. C. F.

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Plate 1

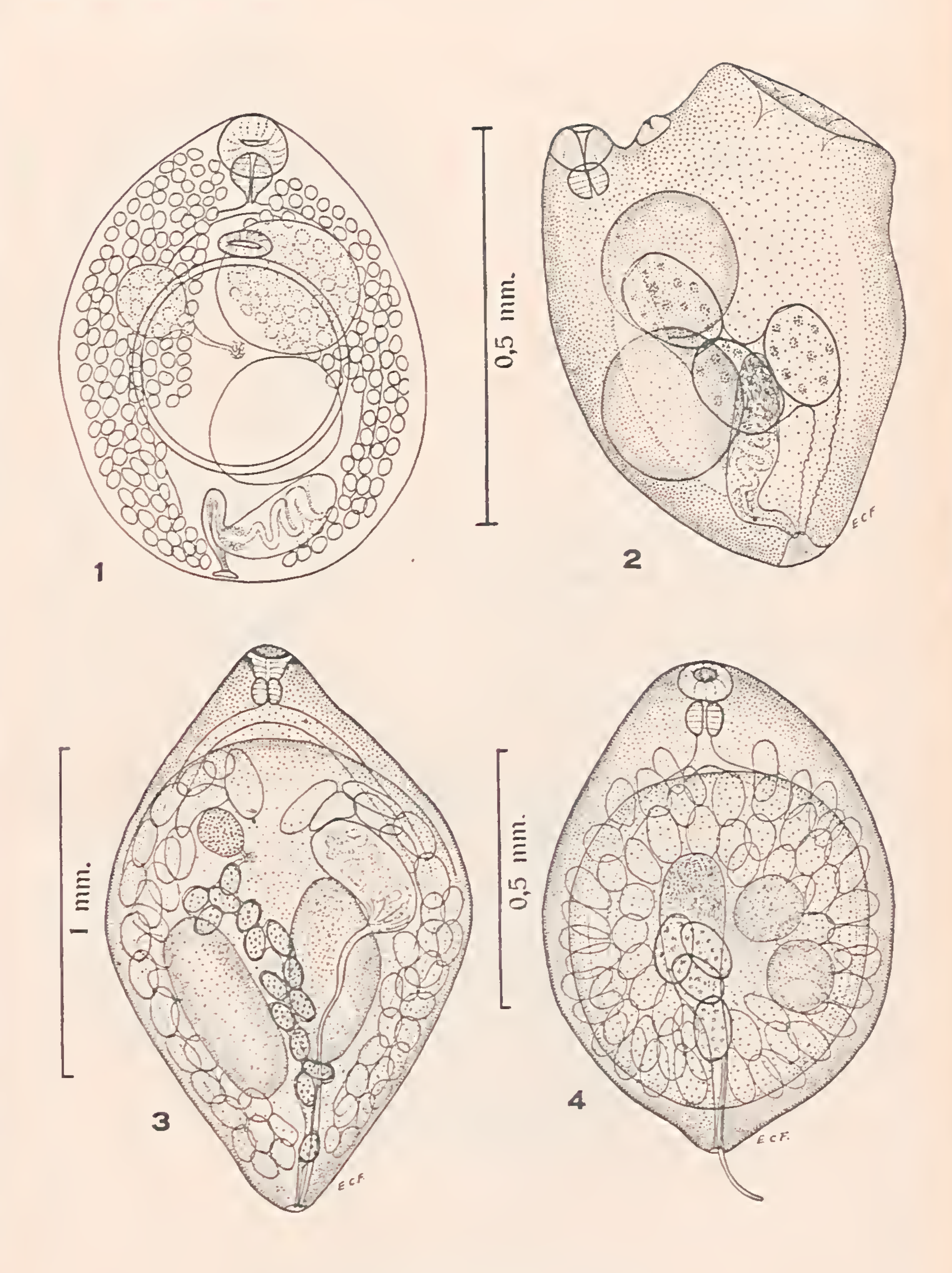
Fig. 1 - *Cyathocotyle szidatiana* n. sp., ventral view. The two large spherical testes, the smaller spherical ovary, the cirrus sac and the vitelline follicles are represented in outline form, and, in addition, the oral sucker, digestive tract, acetabulum and the muscular rim of the holdfast organ.

Fig. 2 — *Cyathocotyle szidatiana* n. sp., right lateral view. The testes, the cirrus sac and three eggs are the only internal structures shown.

Fig. 3 — Ventral view of *Linstowiella* (?) *lutzi* n. sp. from *Gallus gallus domesticus*. Note the shape of the oral sucker, absence of an acetabulum and relation of the component organs within the cirrus sac.

Fig. 4 - Ventral view of *Linstowiella* (?) *bambusicolae* n. sp. The small, spherical ovary, located in the antero-dextral portion of the venter, dorsal to the adhesive disc, is masked by densely granular vitellaria. Note the long, capillary, penial organ.

These figures were all drawn with a Leitz research microscope equipped with compensating oculars and fluorite objectives.



Faust and Tang: Chinese *Cyathocotylidae*.

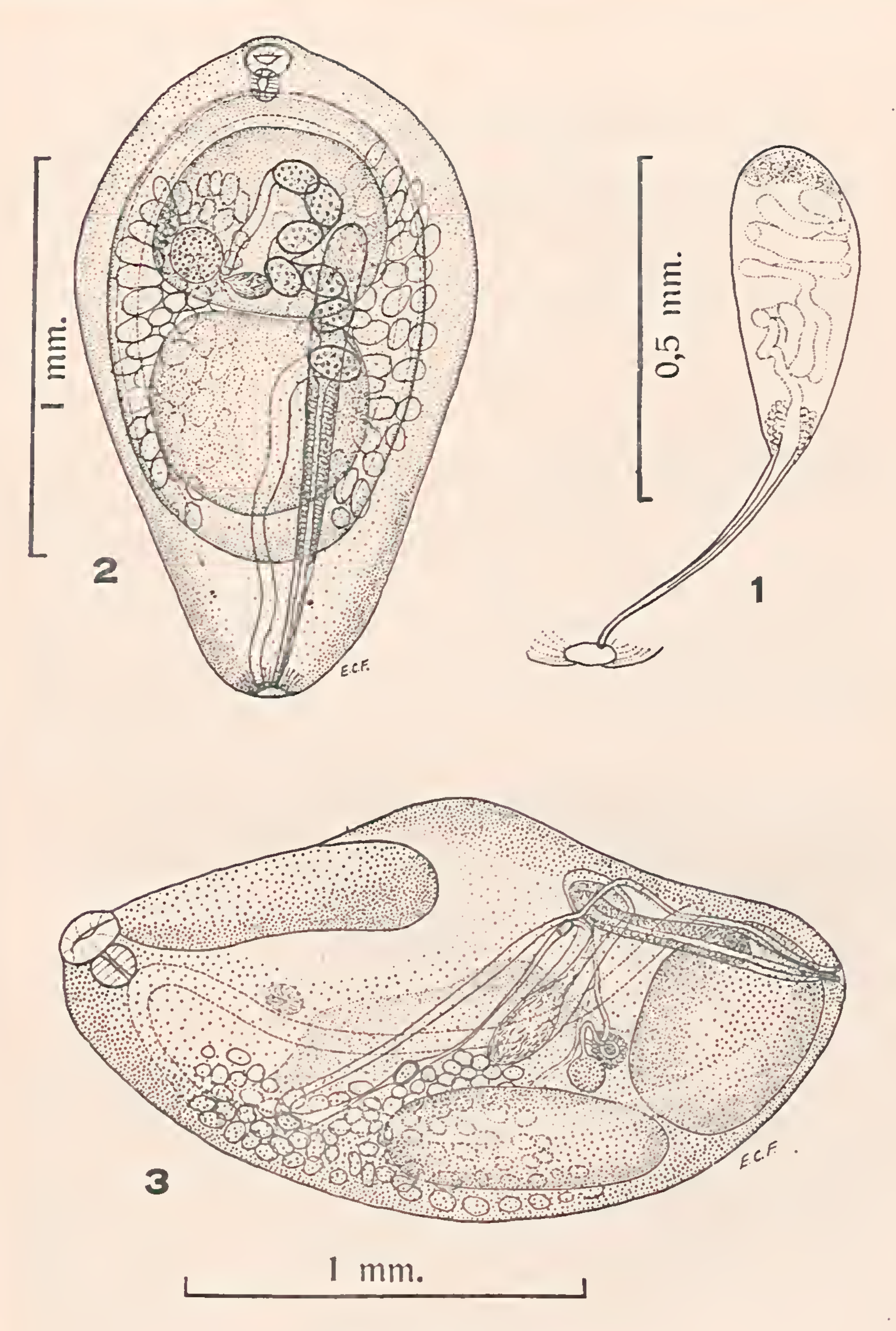
Plate 2

Fig. 1 — *Linstowiella* (?) *lutzi* n. sp., from *Gallus gallus domesticus*. Illustrates in greater detail the cirrus sac and its enclosed organs.

Fig. 2 — Ventral view of *Travassosella pagumae* n. sp. from *Paguma larvata*. Note especially the ovate contour of the adhesive disc and the long, club-shaped cirrus sac, with its median third occupied by prostate gland cells.

Fig. 3 — Right lateral view of *Prosostephanus parvoviparus* n. sp. from *Meles leptorhynchus*. Note especially the small, inconspicuous, essentially non-muscular acetabulum, within the ventral adhesive disc just in front of the holdfast « plug ».

These figures were all drawn with a Leitz research microscope equipped with compensating oculars and fluorite objectives.



Faust and Tang: Chinese *Cyathocotylidae.*

Notas sobre os Nyssorhynchus de S. Paulo

VI. Revalidação de Anopheles (Nyssorhynchus) oswaldoi Peryassú, 1922 e discussão sobre Anopheles (Nyssorhynchus) tarsimaculatus Goeldi, 1905.

A. L. Ayroza Galvão e J. Lane

Departamento de Parasitologia da Faculdade de Medicina e Instituto de Hygiene da Universidade de São Paulo — Brasil

[Com 2 estampas]

Theobald em 1901 creou uma nova variedade de *Anopheles argyritarsis* Rob. Desv., 1827, para os exemplares que possuiam um annel negro no 5.º tarso posterior, denominando-a de *Anopheles argyritarsis* var. *albipes*. A localidade typo desta variedade era a ilha Jamaica.

Posteriormente Goeldi 1905 trabalhando com material do Pará, que elle julgava ser identico a *albipes* de Theobald, propoz por razões linguisticas, que se mudasse esse nome para o de *tarsimaculata*, por condizer mais com os caracteres de coloração dos ultimos tarsos. Nesta publicação dá uma bôa prancha figurando o adulto, reproduzindo umas microphotographias dos ovos em varias posições, que nos parecem mais desenhos a nankim executados de photographias, e menciona varios dados bionomicos. É o seguinte o trecho em que elle propõe a troca de nomes:

> « N'esta occasião não posso esquivar-me de formular uma queixa contra o tal termo *albipes*, que em vez de ajudar o discernimento de certa forma e a retenção do nome, contribúe antes para confundir, tanto mais que tem de navegar ao lado do termo *albitarsis*, pela especie typica. Não são afinal das contas ambas tanto *albipes* como *albitarsis*? Porque não recorrer a uma designação que elimine, de uma feita, a confusão, escolhendo por exemplo *tarsi-maculata*? « (O termo *albitarsis* aqui é usado como var. de *argyritarsis* e não *albitarsis* Arr.).

Em 1903 Theobald considera *albipes*, não como simples variedade, mas como especie. Posteriormente o proprio Theobald (1907) colloca o seu *albipes* e *tarsimaculatus* Goeldi, 1905, em synonymia de *albimanus*.

Dyar & Knab em 1917 descrevem a especie *gorgasi* baseada em um exemplar femea damnificado e proveniente do Panamá. Se seguirmos a descripção deste A., na parte referente ás patas posteriores, notamos que esta especie que cahiria na série *triannulatus*, *rondoni* ou *cuyabensis*. Howard, Dyar & Knab (1917) re-examinaram o typo de *gorgasi* e o consideraram como um exemplar anormal de *tarsimaculatus*, o que os levou a consideral-o como synonymo desta ultima especie.

Estes mesmos AA. Howard, Dyar & Knab (1917) fazem as seguintes considerações a respeito de *tarsimaculatus* Goeldi, 1905:

« Goeldi's name *Anopheles tarsimaculata* was not proposed for a new species, but suggested as a desirable emendation of *albipes*. There is therefore no original description, but the species is figured and with the discussion the new name is published. We have therefore felt justified in recognizing Goeldi's name as the first valid name for the species before us ».

Dão a descripção da femea, do macho, do hypopygio e da larva, figurando em pranchas as azas e os hypopygios de *tarsimaculatus* e *albimanus*, por onde se póde fazer perfeitamente a diagnose entre as duas especies. Aliás, fazendo o diagnostico entre estas duas especies, dizem o seguinte:

« *Anopheles tarsimaculata* closely resembles *A. albimanus* and differs from it in only one important detail, the coloration of the palpi, which shows much more white than in *albimanus*. The abundant material before us shows that this difference is constant and furthermore that the two forms occupy distinct geographic areas ».

E mais adeante: —

« *Anopheles tarsimaculata* was inclued by Theobald in his description of *Anopheles argyrotarsis albipes*, but the major part of that description applies to *albimanus* Wiedemann, and we have accordingly quoted *albipes* under the synonimy of *albimanus*. The specimens before Theobald from British Guiana, Rio de Janeiro, and Antigua are *tarsimaculata*, and the quoted description of the larva belongs here ».

Os AA. com excepção de Townsend (1933 a, 1933 b e 1934) adoptaram o criterio razoavel de Howard, Dyar & Knab, e consideraram a variedade *tarsimaculata* de Goeldi como bôa especie.

Peryassú (1922) creou a especie *oswaldoi*, que differia de *tarsimaculatus* por ter o 2.º tarso posterior com a porção negra medindo 1/6 do total do articulo. Root (1926) considerou-a como synonymo de *tarsimaculatus* mas Costa Lima (1928) mantem-na como bôa variedade desta ultima especie, baseado no seguinte:

« Nos exemplares de *tarsimaculatus* por mim examinados, do Districto Federal, dos Estados do Rio e de Minas Geraes, a referida area preta occupa pouco mais de um terço do segundo articulo tarsal, ás vezes, porém, abrange a metade do segmento e em muitos especimens occupa menos de 1/3. Excepcionalmente comprehende apenas o quarto basal.

Nos especimens de *oswaldoi* que examinei, o annel preto, no maximo, occupa 15 % da extensão do articulo, apresentando-se na maioria dos especimens, ou pouco mais extenso que o annel branco apical do metatarso (1.º articulo tarsal), ou tão extenso ou mesmo menos extenso e neste caso, mal se o destaca da côr branca do resto do articulo ».

A genitalia dos machos, elle as considera iguaes ás de *tarsimaculatus*; nas pupas de *oswaldoi* porém, os espinhos inseridos nos angulos postero-lateraes dos ultimos segmentos abdominaes são mais robustos e mais curtos.

Bonne & Bonne Wepster (1925) reconhecem dois typos de *tarsimaculatus*, um do littoral e outro do «hinterland» do Surinam, com habitos diversos, além de pequenas differenças morphologicas, principalmente referentes ás patas posteriores.

D. P. Curry (1932) creou duas variedades de *tarsimaculatus*, que denominou respectivamente de *aquacelestis* e *aquasalis*. Acredita na possibilidade de *aquacelestis* ser identica á var. *oswaldoi*. Não se refere, entretanto, ás caracteristicas da pupa mencionadas por Costa Lima (1928).

Townsend (1933 a), considerando que Goeldi não quiz crear uma especie nova, mas sim substituir o nome de *albipes* por *tarsimaculata*, e, considerando tambem que os exemplares de Goeldi deviam ser realmente *albimana*, devido aos seus habitos intensamente caseiros, o que não se dá com o *tarsimaculatus* dos AA., collocou *tarsimaculatus* Goeldi 1905 na synonymia de *albimanus*. Além do mais, os ovos que Goeldi figurou são totalmente differentes dos figurados por Root (1926) para *tarsimaculatus*. Por outro lado Townsend trabalhando no rio Tapajóz, Pará, colheu material com as caracteristicas de *tarsimaculatus* AA. e considerou-o como sendo *gorgasi* Dyar & Knab baseado no seguinte:

> «In recent issue of Entomological News, I published a note on *Anopheles* of the *Nyssorhynchus* group, wherein I called attention to the fact that *tarsimaculatus* H., D. & K. is not *tarsimaculatus* Goeldi and employed the name *gorgasi* D. & K. as available for the former. Knab stated (Am. Jn. Trop. Dis. & Prev. Med., 1, 36 footnote) that the holotype of *gorgasi* is perhaps an abnormal specimen and differs from *tarsimaculatus* Auctt. only on coloration of hind tarsi but did not state differences and I do not have access here to the original description. I am thus provisionally accepting the name *gorgasi* as available, on Dyar's unqueried 1928 synonimy. If not available, *oswaldoi* Peryassú is the next available name, though it evidently marks a race distinct from the typical *tarsimaculatus* Auctt.

Neste mesmo trabalho, mas em nota addicional, elle descreve os ovos dos seus *gorgasi* ou *oswaldoi*, (*tarsimaculatus*) muito semelhantes aos figurados por Goeldi para *tarsimaculata*, delles differindo apenas por apresentarem menor numero de gomos nos fluctuadores (25 á 30). Por esta razão pensa que talvez Goeldi tivesse trabalhado realmente com *albipes* Theobald como se póde ver no seguinte trecho:

> All these facts complicate the matter and make it possible that our *gorgasi* is the same as Goeldi's *albipes*, though certainly not the same as Root's *tarsimaculatus* if we may credit his egg figure».

Considera duas variedades, pelo menos, aqui no Brasil, do *tarsimaculatus* dos AA. e que differem pelos ovos: — Uma do Norte, que talvez possa ser subdividida em duas — a sua e a de Goeldi — e outra do Sul, estudada por Root. Considera, igualmente, *oswaldoi* de Peryassú e as referidas por Curry. Acha que as nossas especies serão futuramente divididas em subespecies, como fizeram Hackett, Martini & Missiroli para o *A. maculipennis* na Europa.

Em artigo posterior (1934) fixa a denominação de *oswaldoi* para substituir *tarsimaculatus* AA., descrevendo grande variação dos tarsos posteriores do material de Tapajóz, cuja porção preta varia de 1/9 a 1/3 do comprimento do articulo, mas cujos ovos são identicos. Fixa igualmente a noção de 3 raças de *oswaldoi* (*tarsimaculatus* AA.): uma obtida por Goeldi, outra por Root e outra por elle Townsend.

Julgamos que as razões apresentadas por Howard, Dyar & Knab, e acima citadas, são as mais cabiveis, pois *albipes* uma vez cahido na synonymia de *albimanus*, automaticamente *tarsimaculatus* se torna valido, uma vez que não se prove ser o material que Goeldi trabalhou identico a *albimanus*. Isto parece difficil, pois numa lista organisada por Shannon (1933) dos AA. que trabalharam no Valle do Amazonas não vemos esta especie assignalada, depois que foi divulgado o valor da genitalia para o diagnostico das especies, principalmente para differenciar *albimanus* de *tarsimacutatus*. O proprio Shannon (1933) não a encontrou trabalhando em Iquitos, Porto Velho, Rio Madeira, Manáos, Rio Negro, Bôa Vista (Fordlandia) e Rio Tapajóz. Quanto á marcação dos tarsos posteriores e dos palpos, nas figuras de Goeldi, estarem em ligeira discrepancia com a descripção dada por Howard, Dyar & Knab (1917) bem como o material encontrado por Townsend, lembramos a grande variação que ellas soffrem nos *Nyssorhynchus* em geral e no *tarsimacutatus* AA. em particular. Além disto, os desenhos de Goeldi não deviam ser levados a este rigor de precisão pois vemos que o desenhista nem assignalou as manchas B_1 e B_2 de Root. E não se diga que ellas poderiam ser fundidas no exemplar que serviu de modelo para o desenho, pois neste caso a mancha não poderia ser tão pequena.

Vemos, pois, que a especie *tarsimacutatus* Goeldi é valida, pois o artigo 21 das regras de nomenclatura publicadas no « Proceedings of the Ninth International Congress of Zoology reunido em Monaco em 1913 diz o seguinte:

« O A. de um nome scientifico é a pessoa que publicou em primeiro logar o nome em connexão com a indicação, definição ou descripção, a menos que seja claro do conteúdo da publicação que alguma outra pessoa seja responsavel por tal nome e a sua indicação, definição ou descripção ».

Citamos todos estes AA. para podermos estabelecer de uma vez o conceito da especie *tarsimacutatus* Goeldi, 1905, não por nos comprazermos em finuras de systematica, mas para pôr termo á confusão reinante em torno da validade desta especie e da sua localidade typo, especie esta, já por si tão variavel de uma região para outra e numa mesma localidade.

VARIEDADES DE *ANOPHELES TARSIMACULATUS* Goeldi, 1905.

Pelo exposto julgamos haver actualmente, bem definidas, segundo os AA. 3 variedades de *tarsimaculatus* no Brasil. Adeante veremos que ellas devem ser separadas em duas especies. Caracterisemos, porém, estas variedades:

1. *Anopheles tarsimaculatus* Goeldi, 1905.
   Pará e Norte do Brasil.

2. *Anopheles tarsimaculatus oswaldoi* Peryassú, 1922.
Rio de Janeiro, Minas e Brasil Meridional.
3. *Anopheles tarsimaculatus* cujos ovos foram descriptos por Root (1926).
Rio, Minas Geraes, Brasil Meridional.

PRIMEIRA VARIEDADE

Anopheles tarsimaculatus Goeldi, 1905.

Esta variedade foi bem caracterisada linhas atraz. Possuimos um bom lote de exemplares cujas caracteristicas se enquadram n'ella. Tal material foi colleccionado pelo nosso companheiro de trabalho, Snr. Cesar Worontzow Dashkow, em Fevereiro e Março de 1937 nos rios Parauarí e Maués, á margem direita do rio Amazonas, e no rio Maracapurú, em Setembro de 1936, a uns 200 kms. da margem esquerda do Solimões. São os seguintes os seus caracteres: —

Comprimento médio das azas das femeas, em 20 exemplares, 3,40 mm., tendo como maxima 3,57 e como minima 2,95 mm. Os palpos possuem os dois ultimos segmentos brancos com um annel negro na base e o 2.º segmento com annel branco apical. Os tarsos anteriores apresentam o 1.º e 2.º segmentos com um annel branco apical, o 3.º com um annel negro basal e o 4.º e 5.º negros. A porção negra basal do 2.º tarso posterior é, em média, de 21,8 %, com um maximo de 31 % e um minimo de 20 %. Estas cifras foram um pouco menores para um lote de 5 machos. As azas em ambos os sexos apresentam uma marcação typica de *tarsimaculatus*, onde a mancha B_2 de Root é sempre maior do que a mancha negra que lhe precede. A coloração das escamas claras é de um tom amarello sujo.

Larva e pupa concordam com a descripção de Root (1926).

As terminalias dos machos (Est. 1, fig. 1 e Est. 2, fig. 1) apresentam os lobos dorsaes das pincetas muito pouco chitinisados, mais baixos e mais largos do que o material que possuimos do Brasil Meridional e das figuras e microphotographias apresentadas por Root e Costa Lima. Os pêlos inseridos nestes lobos são muito finos e mais curtos, como se póde ver comparando as figuras 1 e 2 da estampa 2. Taes differenças nos levaram a revalidar a especie *oswaldoi* de Peryassú, 1922.

SEGUNDA VARIEDADE

Anopheles tarsimaculatus oswaldoi Peryassú, 1922.

Tal variedade, que nós estamos convencidos ser uma bôa especie, nos parece bem definida, pois, como já ficou evidenciado atraz, além da porção negra do 2.º tarso posterior ser muito pequena, não indo além de 15 % do articulo, as pupas, conforme mostrou Costa Lima (1928), apresentam os espinhos inseridos nos angulos postero-lateraes dos ultimos segmentos abdominaes mais robustos e mais curtos. R. Pires (1934) trabalhando com material de varias procedencias do Estado de São Paulo, encontrou a marcação do 2.º tarso posterior muito fixa e não excedendo de 14,2 %. Tivemos occasião de examinar o seu material e verificamos que os hypopygios apresentam os lobos

dorsaes das pincetas muito mais altos, mais chitinisados e de pêlos muito mais grossos do que os exemplares do Amazonas (Est. 1, fig. 2 e Est. 2, fig. 2). O mesosoma é egualmente muito mais chitinisado chegando a dar a impressão de possuir um par de foliolos. O nosso material de Lussanvira é identico a este. Chegamos a dissecar o mesosoma de um specimen, para adquirir a certeza de que não possuia foliolos.

TERCEIRA VARIEDADE

Anopheles tarsimaculatus de Root.

O material que Root examinou do Estado do Rio tambem está perfeitamente definido, pois, além dos ovos, tem a marcação do segundo tarso posterior, que como vimos, não vae além de 35 % de negro, tendo em média 23,1 %. Não tivemos occasião de trabalhar com material desta região, mas Costa Lima (1928) que o fez, concorda com estas cifras maximas, e dá uma microphotographia da genitalia do macho, que é identica a dos nossos *oswaldoi* e bastante differente da dos nossos exemplares do Amazonas.

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O material com que Townsend trabalhou nos parece difficil ser uma variedade distincta de *tarsimaculatus* Goeldi, 1905. Elle se caracterisa pelos seus ovos e pela marcação do 2.º tarso posterior, que tem um maximo de 1/3 negro, com um minimo de 1/9 o que cahiria em *oswaldoi* Peryassú, 1922. Aqui talvez Townsend tenha adoptado a mesma opinião de Root, não considerando uma variedade especial para os exemplares que apresentam um nono de preto no 2.º tarso posterior. Quanto aos ovos serem differentes dos obtidos por Goeldi, por terem apenas 28-30 gomos nos fluctuadores, fazemos uma restricção. A figura 133 representada por Goeldi (1905) na pranche O, mostra um ovo visto pela sua face superior, a unica em que se podem contar todos os gomos dos fluctuadores (Est. 2, fig. 3). Embora Goeldi diga serem taes clichés microphotographias, vê-se que se trata de um desenho a nanquim, de traços bastante grossos. Desenhos estes naturalmente tirados das referidas microphotographias. Goeldi não se refere ao numero de gomos. Procuramos contal-os, e não o pudemos fazer com segurança, dado o embaralhamento dos traços que representam taes gomos. O fluctuador representado na porção superior da figura, está melhor desenhado, e permitte que se conte 34 ou 35 gomos. O inferior, porém, é bastante impreciso, como se póde ver na Est. 2, fig. 3. É natural, que assim acontecesse numa época em que o conhecimento da morphologia dos ovos não tinha a importancia que lhe é dada hoje. Aliás tal contagem se torna difficil de realisar, devido ao reflexo que produzem as estrias longitudinaes que possuem os gomos e que podem mascarar a separação entre elles.

Como Goeldi não se refere ao numero de gomos dos fluctuadores, pensamos que tal differença entre os ovos por elle obtidos e os descriptos por Townsend, devam ser olhados com cautela, até que se possa obter novo material e estudal-o a luz deste criterio.

ANOPHELES (NYSSORHYNCHUS) OSWALDOI Peryassú, 1922

Syn. *Anopheles (Nyssorhynchus) tarsimaculatus* Root, 1926.

Como vimos em toda analyse que acabamos de fazer temos dois typos differentes de *tarsimaculatus*: um, do Norte do Brasil, correspondendo á Bacia do Amazonas e perfeitamente caracterisado pelos adultos, outro, do Brasil Meridional, representado por duas variedades, muito semelhantes entre si, mas cujos hypopygios e ovos são bastante differentes dos do Norte.

Se attentarmos, porém, para as differenças de ovos, nos convencemos que tal differença é especifica. Cruzamentos entre variedades que apresentam differenças muito menores entre si, como o *maculipennis atroparvus* e *maculipennis messeae* não são viaveis. Por isso julgamos que o typo do Norte seja o *tarsimaculatus* Goeldi, 1905, e as duas variedades do Sul devem constituir uma especie differente: *Anopheles oswaldoi* Peryassú, 1922. Nella teremos, então duas variedades: a forma descripta por Peryassú, em 1922; e a caracterisada por Root (1926), Costa Lima (1928), C. Pinto (1930) e outros. A estas duas variedades juntamos uma outra, que pensamos ser nova para a sciencia. Assim teremos para *oswaldoi* as seguintes variedades:

1. — *Anopheles (Nyssorhynchus) oswaldoi oswaldoi* Peryassú, **1922.**
2. — *Anopheles (Nyssorhynchus) oswaldoi metcalfi* n. var.
3. — *Anopheles (Nyssorhynchus) oswaldoi noroestensis* n. var.

PRIMEIRA VARIEDADE

Anopheles (Nyssorhynchus) oswaldoi oswaldoi Peryassú, 1922.

Caracterisado perfeitamente na sua forma adulta, larval, e pupal por Peryassú (1922) e Costa Lima (1928) como vimos linhas atraz. Chamamos apenas a attenção para maior chitinisação do lobo dorsal das pinças e do mesosoma acima referido.

Ovos desconhecidos.

SEGUNDA VARIEDADE

Anopheles (Nyssorhynchus) oswaldoi metcalfi n. var.

Caracterisado por Root (1926) na sua forma adulta, de pupa, de larva e de ovo.

Differe da precedente pela marcação do 2.º tarso posterior, cuja area negra, é no minimo de 25 % do articulo, segundo Costa Lima (1928).

O ovo (Est. 2, fig. 4) apresenta apenas um collarinho no pólo cephalico. Os fluctuadores tomam todo o seu comprimento e apresentam de 40 á 45 gomos. Differe da variedade de Lussanvira por não apresentar elevações ovaladas do exocorion nas faces lateraes e inferior e sim pequenas estrellas formadas de 8 ou 10 linhas irradiando de um centro imaginario, segundo a descripção de Root (1926).

Propomos o nome de *metcalfi* em homenagem á memoria do grande entomologista que foi Francis Metcalf Root e a cujos trabalhos se deve a individualisação desta variedade.

TERCEIRA VARIEDADE

Anopheles (Nyssorhynchus) oswaldoi noroestensis n. var.

Em recente trabalho, Galvão, Lane e Corrêa (1937) descreveram os ovos de *tarsimaculatus* do Novo Oriente, proximo de Lussanvira, E. F. N. O. B., e alguns dados biologicos.

Taes ovos (Est. 2, fig. 5) obtidos de femeas com marcação identica, excepto o 2.º tarso posterior, que em uma tinha 26,8 % de negro e na outra 50 %. Elles medem 451 a 501 micra de comprimento por 186 e 198 micra de maior largura. Os fluctuadores tomam quasi todo o comprimento do ovo e medem 361 a 413 micra de comprimento e apresentam 34 a 40 gomos, que são percorridos no sentido do seu grande eixo por estrias, havendo um sulco maior separando cada um destes gomos. O pólo cephalico apresenta um collarinho na face superior guarnecido de estrias. No pólo caudal não existe collar. Estes ovos, como vemos, são muito semelhantes aos de *metcalfi*, que Root descreveu como tendo esta mesma configuração, com quasi o mesmo numero de gomos nos fluctuadores (40 á 45). Differem delles, porém, por apresentarem nas faces lateraes e inferior o exocorion todo differenciado em elevações bastante grandes, regulares, ovaes, granulosas e côr de perola, identicas ás elevações que descrevemos para os *strodei* dos arredores de S. Paulo (Galvão e Lane, 1936). Taes elevações não existem nos ovos de *metcalfi*, conforme se póde verificar no seguinte trecho de Root (1926):

> «The surface ornamentation seemed to be the same in all three eggs». (Refere-se a *albitarsis*, *darlingi* e *metcalfi*).
>
> «The species of the *Nyssorhynchus* group seem not to show the elongate hexagonal markings so conspicuous in the eggs of such species as *quadrimaculatus* or *pseudopunctipennis*. Instead, one finds the whole ventral and lateral portion of the egg studded with little stars, each consisting of eight or ten short lines radiating from an imaginary common center».

Julgamos não ter havido má observação por parte de um pesquisador como Root, pois, do contrario, não iria descrever em logar de elevações, pequenas estrellas com 8 a 10 raios, cousa muito mais difficil de se observar. Por esta differença dos ovos, julgamos estar deante de uma variedade distincta da de *metcalfi*, variedade esta no senso das descriptas por Hackett, Missiroli e Martini, para os *maculipennis* da Europa.

Os adultos que capturamos na mesma região ou que criamos de larva, apresentam porte grande. As azas das femeas, medem em média 3,74 mm. com um minimo de 3,33 mm., e um maximo de 4,28. Não damos as medidas dos machos por serem elles todos de criação no laboratorio. Os palpos apresentam um annel negro basal no 3.º e 4.º segmentos, e um annel branco apical no 2.º. Os tarsos anteriores apresentam os 1.º e 2.º segmentos com anneis

brancos apicaes e o 3.º com annel negro basal; o 4.º na maior das vezes é todo negro, mas as vezes apresenta um annel branco apical; o mesmo se diga do 5.º segmento. Tarsos médios com anneis brancos apicaes nos dois primeiros segmentos. Tarsos posteriores com annel branco distal no 1.º segmento; porção negra basal do 2.º articulo variando de 26,8 % á 75 % com uma média de 53 %.

A genitalia dos machos (Est. 1. fig. 2; est. 2, fig. 2) é identica ás de *oswaldoi oswaldoi* que possuimos no laboratorio.

Esta variedade se cria nas grandes lagôas á beira do Tietê, em pequenos alagados e ribeirões, abertos ao sol ou cobertos de vegetação relativamente alta e com léve correnteza, em poças d'agua sob grandes arvores, na floresta, com pouca illuminação. Estes ultimos criadouros parecem ser os mais favoraveis, o facto merecendo maior observação. O pH de um dos seus criadouros nos alagados de ribeirão era de 6,8.

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Vemos pelo exposto, que as tres variedades de *oswaldoi* formam um grupo bem definido. pois, se de um lado não conhecemos os ovos da forma typica, por outro lado temos a sua terminalia identica á var. *noroestensis*. Por sua vez esta ultima tem os ovos muito semelhantes aos de *metcalfi*. Estes ovos e a terminalia das tres formas são muito differentes de *tarsimaculatus* Goeldi, 1905.

SUMMARY

1. — The aa. review the bibliography relating to the *tarsimaculatus* species and come to the following conclusions: —

   a) the material worked by Townsend (1933-4) is really *tarsimaculatus* Goeldi 1905,

   b) the *tarsimaculatus* which Root (1926) examined is not the same species as the material which Goeldi and Townsend worked with but coincides with the description of the adults of *Oswaldoi* Peryassú, and so, this species is revalidated.

2. — Under this criterion, *tarsimaculatus* aa. is divided in two species one which Goeldi (1905) and Townsend (1933-34) examined and that probably have several races and another species which Peryassú, Root and aa. examined.

3. — This second species, *oswaldoi* Peryassú, 1922, was found to have three varieties which are named and characterised as follows: —

   a) *Anopheles (Nyssorhynchus) oswaldoi oswaldoi* which is known by its very narrow black ring on the second posterior tarsal,

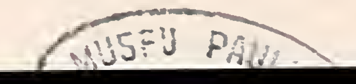
   b) *Anopheles (Nyssorhynchus) oswaldoi metcalfi* was created by characters of egg and adult and named in honor of the late Francis Metcalf Root.

   c) *Anopheles (Nyssorhynchus) oswaldoi noroestensis* that is described in this paper from specimens captured in Lussanvira, State of São Paulo, Brazil and can be separated also by characters of egg and adult.

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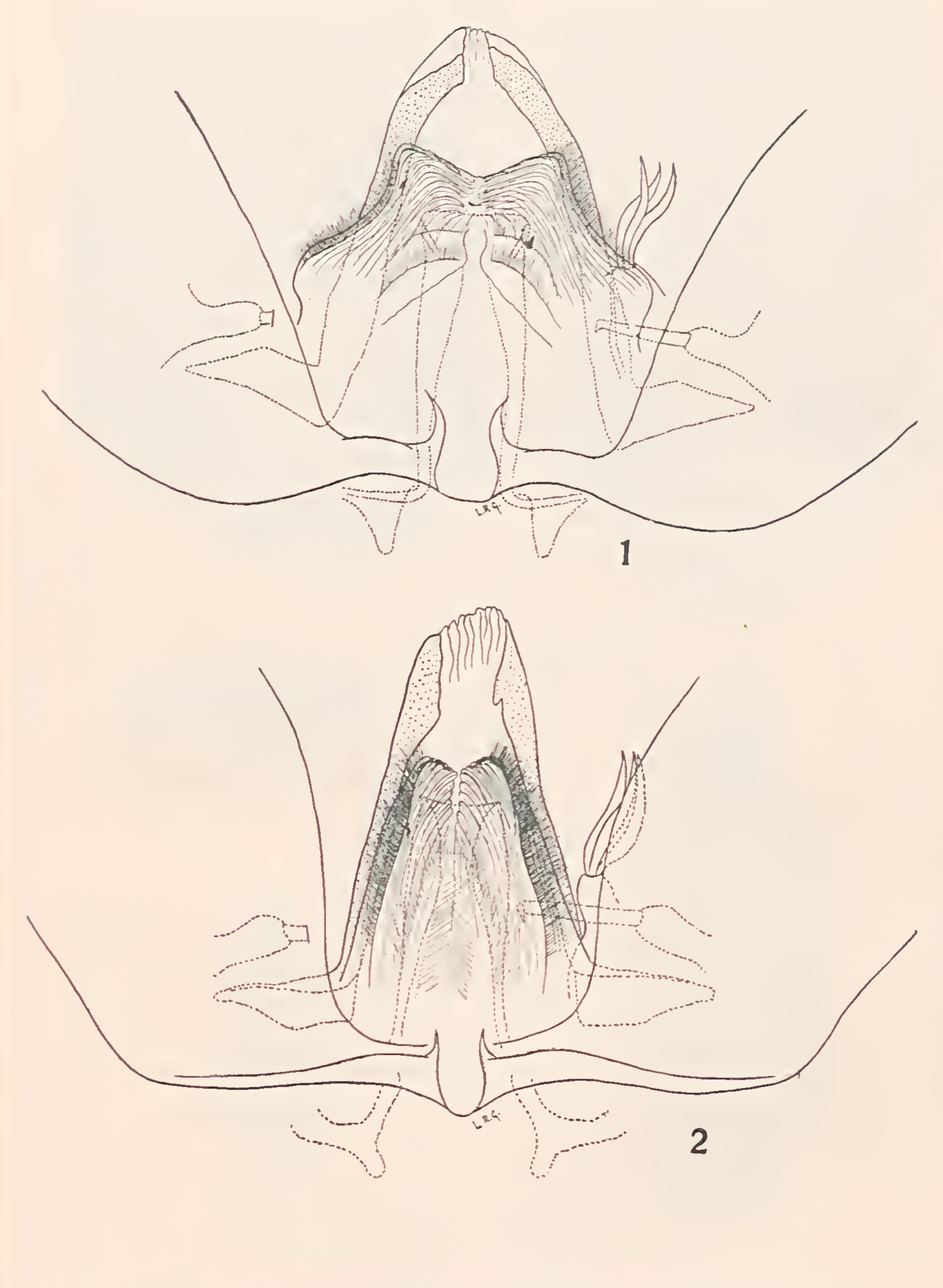
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Estampa 1

Fig. 1 — Desenho em camara clara da terminalia de *A. tarsimaculatus* Goeldi. 1905. L. R. Guimarães, del.

Fig 2 — Desenho em camara clara da terminalia de *A. oswaldoi* var *noroestensis* n. var. L. R. Guimarães del.



Galvão & Lane: *Nyssorhynchus* de S. Paulo. VI.

Estampa 2

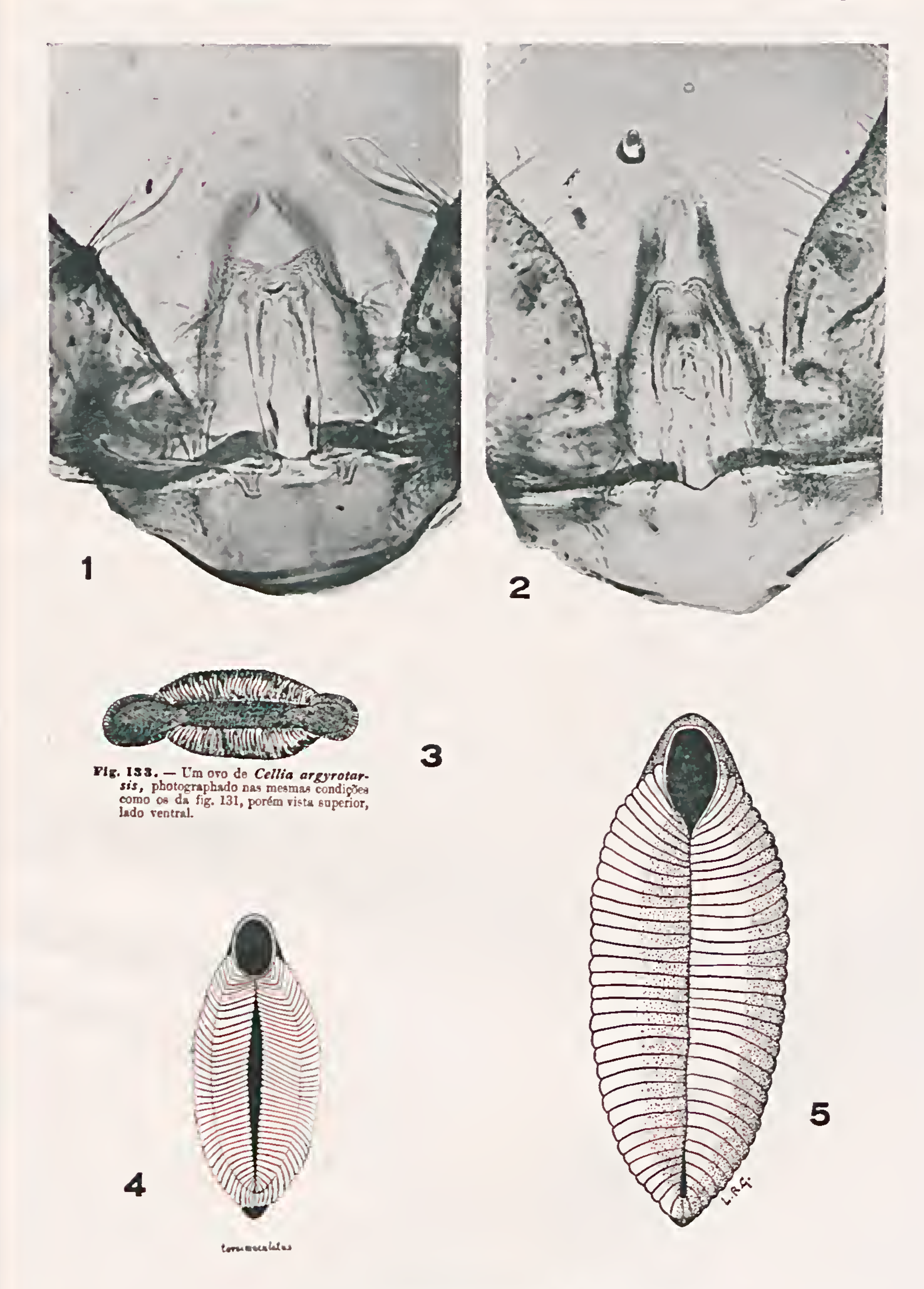
Fig. 1 — Terminalia de *A. tarsimaculatus* Goeldi, 1905. D. Lili Ebstein, photographa.

Fig. 2 — Terminalia de *A. oswaldoi* var. *noroestensis* n. var. D. Lili Ebstein, photographa

Fig. 3 — Ovo de *A. tarsimaculatus* segundo Goeldi. Os Mosquitos do Pará, 1905 Prancha O. fig. 133.

Fig. 4 — Ovo de *A. oswaldoi* var. *metcalfi* n. var., segundo Root, The Am. Jn Hg. **6** (5) : 684, 1926.

Fig. 5 — Desenho do ovo de *A. oswaldoi* var. *noroestensis* n. var. L. R. Guimarães del.



Galvão & Lane: *Nyssorhynchus* de S. Paulo. VI.

Observations on two free-living nematodes, Hexatylus coprophagus n. sp., and H. consobrinus (de Man, 1906) Goodey, 1932

T. Goodey, D. Sc.

Principal Research Assistant, Institute of Agricultural Parasitology, (London School of Hygiene and Tropical Medicine), Winches Farm, Hatfield Rd., St. Albans, England.

[With 2 plates]

INTRODUCTION

The genus *Hexatylus* was established by the writer (1926), with *H. viviparus* as the type species, for nematodes found in a diseased potato tuber and afterwards in a gladiolus corm. The worms are very similar both in shape, size and general appearance to the Stem Eelworm, *Anguillulina dipsaci*, but differ from this parasite in possessing no median, rounded oesophageal bulb, in the mouth spear having 3 basal swellings each of which is bi-lobed; thus giving an appearance of 6 basal knobs, instead of 3 and in having no post-vulval uterine sac. The original description was amplified in certain anatomical details in a short note published the same year (1926 a). In a later paper (1932) the writer transferred to this genus *Tylenchus fungorum* Bütschli, 1873, and *Tylenchus consobrinus* de Man, 1906, which became respectively *Hexatylus fungorum* (Bütschli) and *H. consobrinus* (de Man).

In the present paper a description is given of an additional species belonging to the same genus, namely, *H. coprophagus* n. sp. At the same time some details are given on the morphology of *H. consobrinus* a species which has been dealt with previously only by de Man (1906) and Micoletzky (1921). De Man's original description was based on three female specimens; the male being quite unknown to him, whilst Micoletzky, found 7 adult females and two males. The writer has been fortunate in being able to base his observations on 21 females and 7 males.

Hexatylus coprophagus n. sp.

(Pl. 1, figs. 1-4).

In an aqueous extract of rather old sheep droppings, taken from a pasture at Winches Farm in 1928, amongst a large number of various free-living nematodes, there were found 3 or 4 specimens of the present species. Some measurements and drawings were made at that time but examples of the worm were not seen again until 1932 when in a further extract of sheep droppings from the same pasture 12 examples of the worm were found. Females

only have been encountered; the male, if it exists, has not been found. The worms were fixed in hot glycerine alcohol and finally mounted in glycerine. The present description is based on these mounted specimens and on the notes and drawings made in 1928.

Dimensions: — Length, 0.88 mm. to 1.45 mm., $a = 18.5-28$, $\beta = 6.3-7$, $\gamma = 8-10.4$, $V = 82\%-86\%$, mouth spear, 11-12 microns.

The general shape and appearance of the worm is shown in fig. 1, where it can be seen that the body is comparatively stout. It tapers anteriorly a little in the oesophageal region and posteriorly from the vulva backwards; the tail being drawn out to a fine point.

The cuticle is striated transversely. The head is not distinctly offset: only a faint constriction separating it from the body. It is rather flat and shallow and appears to be made up of 6 somewhat roundly conical lips. Behind the anus the body tapers sharply to the tip of the filiform tail.

The buccal orifice leads into a short vestibule in which lies the front part of the mouth spear. The latter is rather small and delicate in structure. It appears to be composed of the usual two parts: an anterior conical and a posterior cylindrical portion. The former is about one half the length of the latter. There are very small knob-like thickenings at the base of the spear but it has not been possible to determine their exact number. They appear in optical section to be lateral thickenings of the spear base, not extending across its lumen.

The oesophagus consists of a fusiform anterior portion which is somewhat swollen posteriorly just before it narrows to the isthmus which is crossed by the nerve ring. Behind this it seems to expand into an irregularly shaped glandular region (rather like the corresponding region in *H. viviparus* which blends indefinitely with the beginning of the intestine. In one or two specimens it has been possible to find a comparatively large nucleus, probably the nucleus of the dorsal oesophageal gland cell, but the nuclei of the sub-ventral gland cells have not been located with certainty. In many of the specimens the anterior end of the ovary was found lying in this region of the body and this made it extremely difficult to distinguish the arrangement of the various organs here The oesophagus is traversed by a narrow lumen into which the dorsal oesophageal gland opens by a short lateral duct just behind the base of the spear.

The excretory pore is large and distinct and occurs at about the level of the end of the glandular part of the oesophagus. The orifice is circular and the walls of the duct are lined for a short distance with refractive cuticle. The junction of the oesophagus and the intestine is very indistinct and the writer has not found it possible to distinguish clearly the blending of the oesophageal lumen with that of the intestine. The latter ends in a short rectum which leads to the anus.

The vulva is situated far back on the body as a pronounced lateral slit with rounded lips. The short vagina leads inwards and forwards to the gonad which is single and lies outstretched anteriorly. The uterus holds one egg at a time. It is connected in front with the oviduct and this blends imperceptibly with the ovary which extends into the vicinity of the oesophagus. There is no post-vulval uterine sac.

Systematics. — The present species differs from *H. viviparus* in its longer and more filiform tail, in having 6 roundly conical lips, in the mouth spear,

of which the anterior conical part is about half the length of the posterior part and in the character of the basal thickenings of the spear. These differences are such as to render necessary the creation of a new species, namely *H. coprophagus* n. sp.

Hexatylus consobrinus (de Man, 1906) Goodey, 1932.

(Pl. 2, figs. 1-6).

The 28 examples of this species studied by the writer were obtained in December 1931 by Baermann funnel extraction of a piece of turf from a bowling green in South Wales. The soil was of a sandy texture; a point of interest in view of the fact that the specimens investigated both by de Man and by Micoletzky were also obtained from sandy pasture soil.

Dimensions: — Female, length, 0.96 mm. to 1.21 mm., $a = 27-36$, $\beta = 5.7-7.3$, $\gamma = 19-23$, $V = 89.2\%-90\%$. Male, length, 0.83 mm. to 0.98 mm., $a = 36-45$, $\beta = 6.3-7.7$, $\gamma = 17.5-23$, spicules 25 microns, gubernaculum 10 microns, mouth spear 12—13 microns.

Female. — De Man's account of the anatomy of the female worm, his drawing of the entire worm and its tail end are fully adequate for the identification of this species. The specimens examined by the writer agree in all particulars of shape, appearance, dimensions and proportions and thus render a re-description of the adult female unnecessary. For the sake of completeness, however, a drawing of a female is given in Pl. 2, fig. 1.

Male. — The only previous description of the male is that given by Micoletzky (1921) whose fig. 43 d. shows the tail end in lateral view. As this author had only two adult specimens on which to base his account, the writer proposes to give a more detailed descriptions based on the examination of the 7 specimens which were available.

As the foregoing dimensions and proportions show, the adult male is smaller and slenderer than the adult female, though none of the examples studied by the writer was as small as those examined by Micoletzky who gives 0.53 mm. and 0.68 mm. as the lengths of his two specimens.

The head (Pl. 2, fig. 1) has the shape of a flat cap with convex sides. It appears to be divided up into six radial segments, as commonly found in the heads of species of *Anguillulina*. It is offset from the body by a faint constriction. The cuticle of the body is transversely striated. The buccal cavity is in the form of a short tube in which lies the anterior end of the mouth spear. The latter has the usual structure; the two parts, anterior conical and posterior cylindrical, being about equal in length. The three basal swellings are quite small. The oesophageal region is shown in Pl. 2, fig. 3, where it can be seen that there is no median, muscular eosophageal bulb but merely a rather spindle-shaped fore part separated from the posterior glandular part by a narrower isthmus across which lies the nerve ring. The glandular part appears to be a little more sharply defined than in *H. viviparus* and *H. coprophagus* and has much the appearance of the corresponding region in many species of the closely related genus *Anguillulina*. The writer has not been able to distinguish all three of the nuclei of the oesophageal gland cells which make up this region but has located what is probably the nucleus of

the dorsal oesophageal gland. The duct from this gland cell opens into the lumen of the oesophagus in the usual place just behind the base of the spear. The excretory pore is situated on the ventral body wall in the region of the posterior part of the oesophagus.

The tail (Pl. 2, figs. 5-6) tapers to a conical point and is surrounded, as noted by Micoletzky, by the bursal wings which are also pointed at the tip. These wings arise from the cuticle a little in advance of the heads of the spicules. There are no caudal papillae or ribs supporting the bursa. The cloacal aperture is situated on a distinct ventral prominence. The spicules are paired and, when seen in lateral aspect, have the appearance shown in Pl. 2, fig. 6, which is very similar to that of the spicules of *Anguillulina dipsaci*. The head of each is somewhat expanded and is open at the fore end. This part is about one third the length of the whole structure. The shaft of each spicule tapers gradually to a narrow point. The gubernaculum is simple. The gonad is single, extending anteriorly in the body, and has the usual structure.

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Plate 1

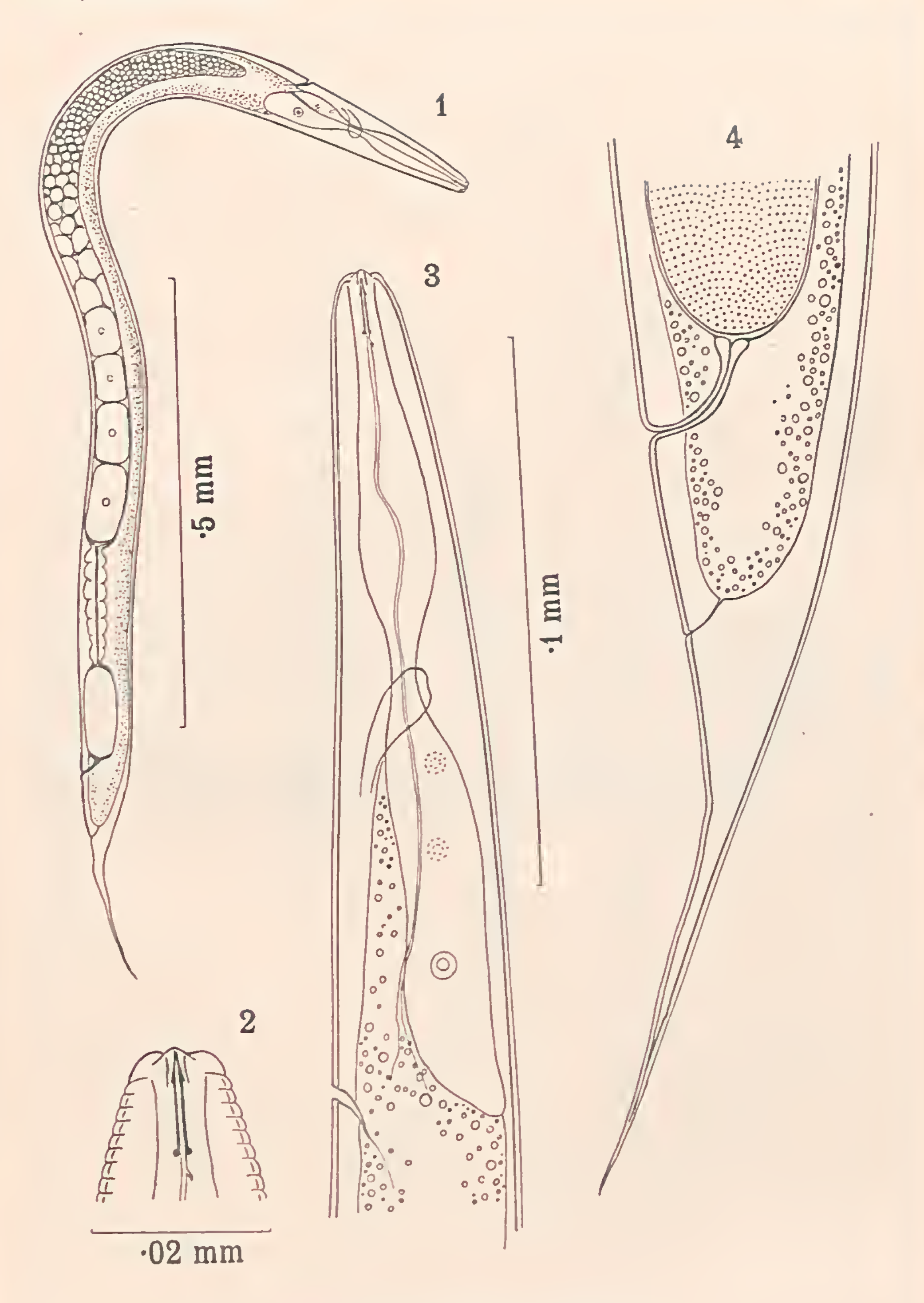
Hexatylus coprophagus n. sp.

Fig. 1 — Adult worm under low magnification to show general appearance and structure; lateral view.

Fig. 2 — Head end in lateral view, highly magnified; showing 3 of the 6 lips and mouth spear.

Fig. 3 — Oesophageal region under high magnification, in lateral view. Two nuclei are indicated in dots to show that their location is uncertain.

Fig. 4 — Tail end under high magnification, in lateral view. Part of an egg shown in the uterus. The figure is enlarged to the same scale as fig. 3.



Goodey: Two free-living nematodes.

Plate 2

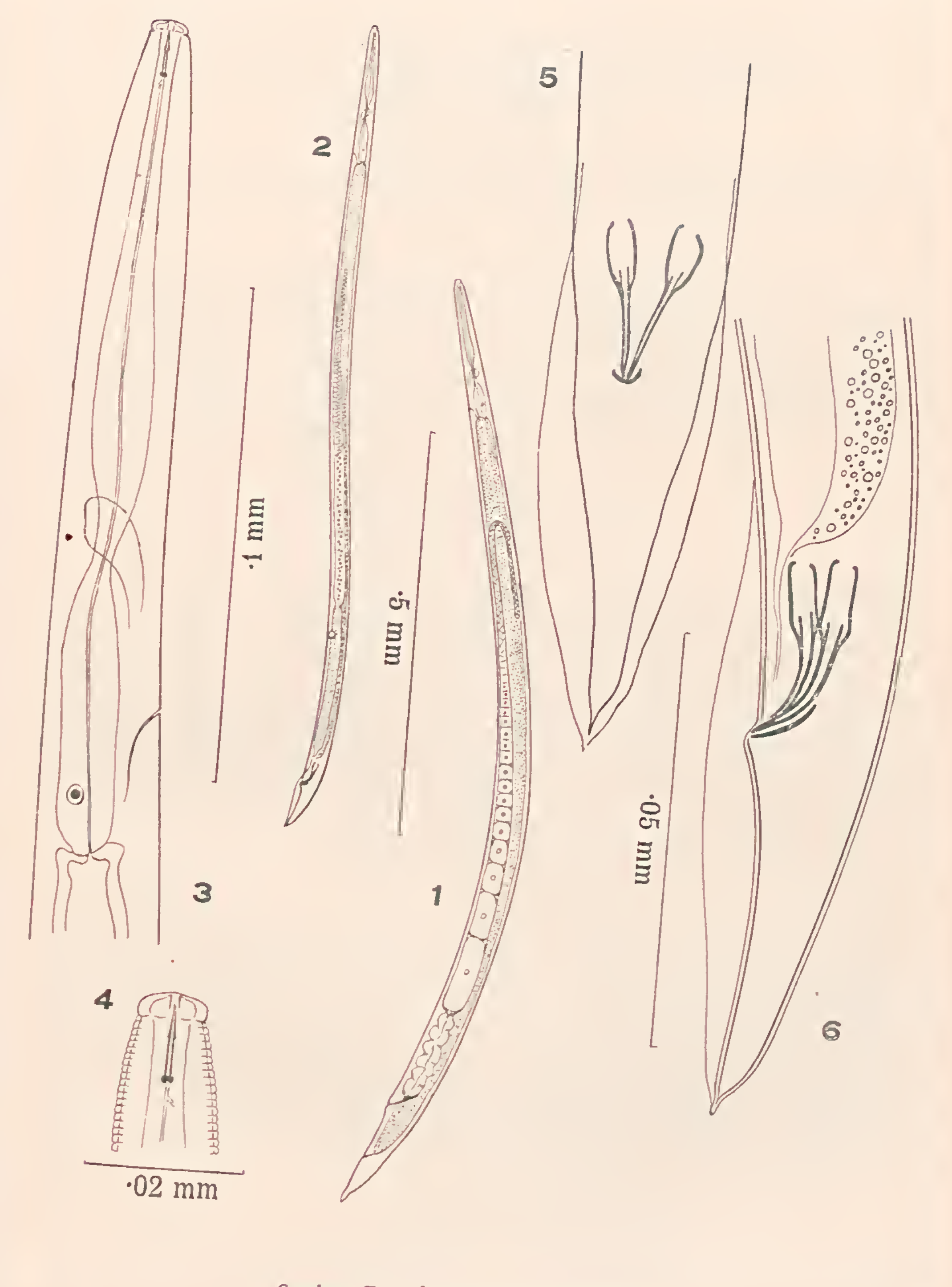
Hexatylus consobrinus (de Man, 1906) Goodey, 1932.

Figs. 1 e 2 — Adult female and male respectively under low magnification to show general shape and structure. These figures are enlarged to the same scale.

Fig. 3 — Oesophageal region of a male under high magnification, lateral view.

Fig. 4 — Head and more highly magnified to show shape of head and mouth spear.

Figs. 5 e 6 — Male tail in ventral and lateral aspect respectively, highly magnified, showing arrangement of bursal wings and shape of spicules and gubernaculum. These figures are enlarged to the same scale.



Goodey: Two free-living nematodes.

Sobre uma nova especie de Nycteribiidae (Diptera-Pupipara)

L. R. Guimarães
Departamento de Parasitologia da Faculdade de Medicina da Universidade de São Paulo - Brasil

[Com 1 estampa]

Scott * assignala 13 especies de *Nycteribiidae* do genero *Basilia* Ribeiro, 1907, parasitando morcegos do novo mundo, das quaes apenas tres provenientes do Brasil.

Na presente nota descrevemos mais uma especie desses ectoparasitas proveniente de Tapera, Pernambuco. A nossa descripção é baseada em especimens conservados em alcool.

Basilia travassosi n. sp.

Especie pequena, com cerca de 1,5 mm.

Femea. — Cabeça afunilada e comprimida lateralmente; vertex apresentando 5-6 cerdas de tamanhos desiguaes na sua borda anterior, 2 das quaes inseridas entre os olhos que são typicamente bifacetados. Gena e post-gena apresentando cerca de 16 cerdas de diversos tamanhos. Palpos curtos com 12 cerdas fortes, sendo as apicaes as mais longas. Antenna apresentando o prolongamento dorsal do segmento basal («pedicle») delgado e inteiramente recoberto de finos pêlos, os quaes revestem tambem a parte dorsal e a borda anterior deste segmento. Flagello espherico. Arista ramificada e inteiramente coberta por uma penugem muito delicada.

Thorax como nas outras especies do genero; borda anterior mais arredondada que em *B. speiseria*; mesonoto elevado posteriormente como em *B. speiseria*.

Abdomen curto. 1.º tergito visivel mais longo que largo e apresentando sua maior largura ao nivel dos dois terços anteriores; suas bordas, tambem nos dois terços anteriores, mais chitinisadas; borda do terço posterior convergindo obliquamente para o centro e para traz, formando um angulo largamente arredondado. Cerca de 35 pequenas cerdas irregularmente distribuidas por toda a face deste tergito; 3-4 cerdas maiores acompanham as bordas do terço posterior e 8 outras, com as bases muito unidas, teem nascimento na extremidade apical deste segmento. Segundo segmento visivel nitidamente separado e apresentando a borda anterior largamente escavada na linha mediana e a posterior recta; algumas cerdas curtas acompanham sua borda anterior; 6-7 cerdas se agrupam junto á linha mediana na porção anterior; o

* The Linnean Society's Journal — Zoology Vol. XXXIX (N. 267) Abril 1936, p. 497.

restante da superficie deste tergito é inteiramente glabro, exceptuando-se a borda posterior que é marginada por uma fileira de cerdas fortes, attingindo algumas dellas grande comprimento. Segmento anal com as bordas lateraes mais chitinisadas, levemente convergentes posteriormente e apresentando 9-10 cerdas. Superficie ventral com o esternito basal occupando mais da metade do comprimento do abdomen e apresentando, em sua superficie, innumeras cerdas distribuidas em diversas fileiras, e na borda posterior, o ctenidio com cerca de 55 dentes.

O connexivo, que se inicia sob o esternito basal, apresenta diversas fileiras de pequenas cerdas, além de outra de cerdas bem maiores que converge obliquamente em direcção a linha mediana. Posteriormente a essa fileira de cerdas maiores o connexivo é revestido por numerosos espinhos pustulados. Sobre o segmento terminal, cuja superficie é glabra e apresenta cerca de 9 cerdas de tamanhos desiguaes nos angulos latero-posteriores, encontramos uma placa mais chitinisada com diversas cerdas.

Macho: — Semelhante á femea, exceptuando-se o abdomen que tem a forma conica com a extremidade truncada. Superficie dorsal apresentando sete tergitos. Tergito basal pequeno e apenas indicado por uma fileira de cerdas apicaes além de outras menores sobre sua superficie.

Tergitos 2-6 com a superficie glabra e apresentando em suas margens distaes uma fileira de cerdas grandes e pequenas, sendo as maiores sobre o 6.º; 7.º tergito glabro na porção proximal e com diversas cerdas na metade distal e bordas.

Esternito basal muito mais curto que o da femea, apresentando cinco fileiras irregulares de cerdas curtas. Os esternitos entre o basal e o anal e que são praticamente indistinguiveis apresentam 2-3 fileiras de cerdas muito irregulares e o mais apical delles cerca de vinte dentes fortes (ctenidio) irregularmente distribuidos junto á linha mediana. Segmento anal glabro excepto em suas bordas lateraes e apicaes que apresentam numerosas cerdas. Clasper forte, bastante chitinisado, com o apex quasi preto e apresentando seis cerdas fortes em todo o seu comprimento.

Holotypo femea e allotypo macho na collecção de insectos do Laboratorio de Parasitologia e colleccionados por D. Bento Pickel em Tapera, Pernambuco, em Janeiro de 1927.

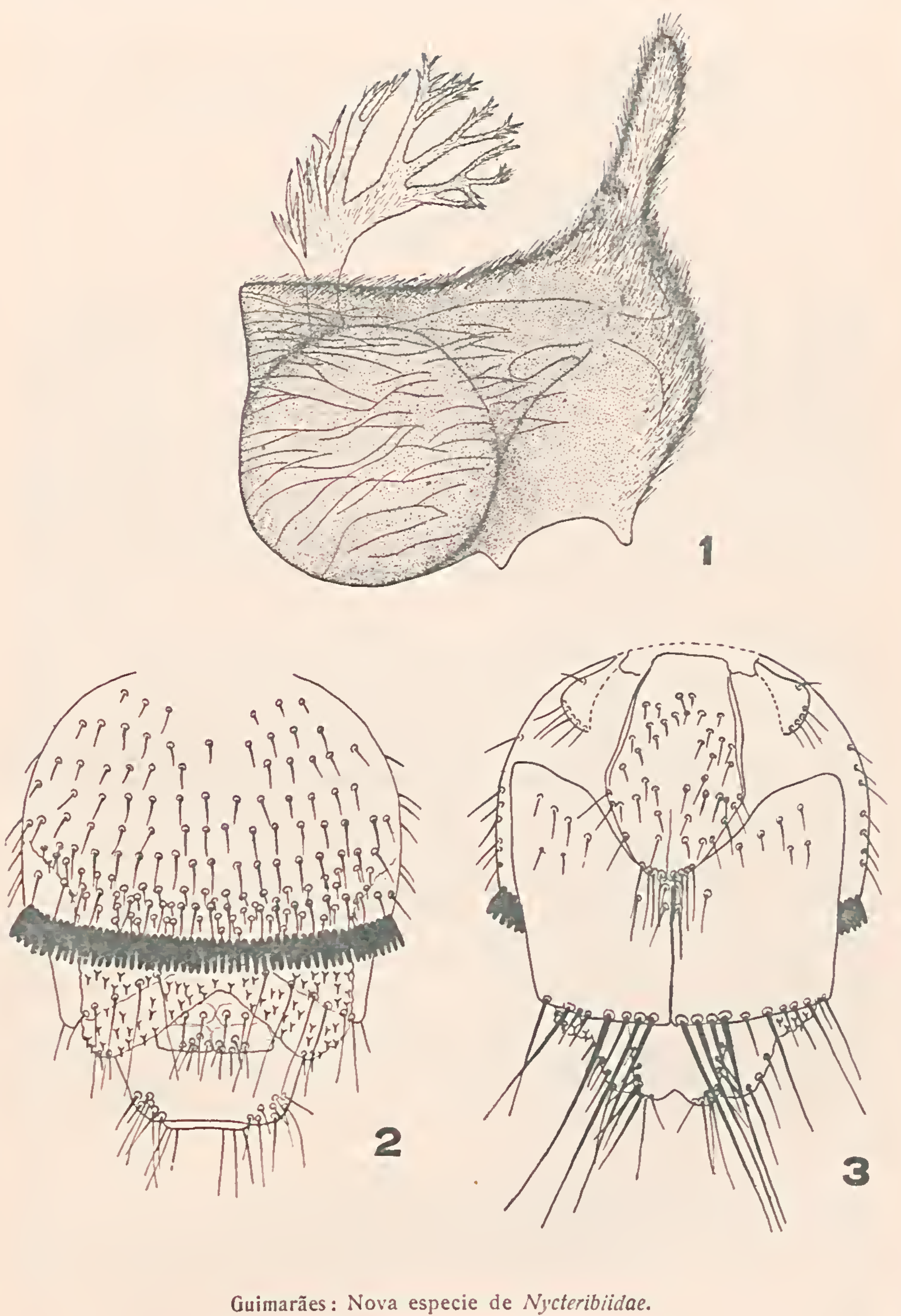
Paratypos: 7 femeas tambem da mesma procedencia e collecionador. Infelizmente não nos foi possivel obter o nome do morcego hospedador.

Dedicamos esta especie ao eminente parasitologista patricio, Dr. Lauro Travassos, do Instituto Oswaldo Cruz.

Devido á gentileza do Prof. A. Costa Lima, tivemos opportunidade de examinar a collecção de *Nycteribiidae* do Instituto Oswaldo Cruz, onde assignalamos a presença de uma especie muito affim á *Basilia travassosi*, tambem proveniente de Tapera, Pernambuco. Os exemplares do Prof. Costa Lima são montados em balsamo e apresentam algumas differenças em relação aos nossos, que os fazem merecer estudo mais acurado.

Estampa 1

Fig. 1 — *Basilia travassosi* n. sp. Antenna do macho.
Fig. 2 — *Basilia travassosi* n. sp. Abdomen da femea, lado ventral.
Fig. 3 — *Basilia travassosi* n. sp. Abdomen da femea, lado dorsal.



Guimarães: Nova especie de *Nycteribiidae*.

Syntomideos (Amatideos = Euchromideos) do Estado do Pará

Dr. Godofredo Hagmann.

Chefe da Secção de Zoologia do "Museu Paraense Emilio Goeldi" — Brasil

Entre os Lepidopteros, a familia dos Syntomideos (Amatideos ou pela nomenclatura mais moderna Euchromideos) merece para nós, aqui na região neotropical, um interesse especial, pelo facto da mesma encontrar na região e principalmente na sua parte tropical, um desenvolvimento extraordinario.

Como Seitz menciona na sua grande obra sobre Lepidopteros, conhecia-se em 1892, conforme o catalogo de Kirby, 700 e tantas especies e em 1898 figuram no catalogo de Hampson já 1.200. Pelo supplemento desse catalogo, publicado em 1914, o numero de especies conhecidas elevou-se a 2.200 em somma redonda, sendo 4 especies européas, umas 500 asiaticas e africanas e as restantes 1.700 pertencendo á fauna americana. Não será exaggerado admittir que o numero das especies americanas, conhecidas até hoje, já vae bem além de 1.800.

Tanto para o Norte como para o Sul do Continente Americano, o numero de especies diminue, assim que na parte septentrional da America do Norte encontram-se ainda 3 especies e pelo extremo Sul, já na altura de Buenos Ayres, observa-se a mesma diminuição, não sómente no numero das especies, como tambem no de especimens, todas formas sombrias. A maior riqueza em especies de Syntomideos encontra-se na *Hylea* da enorme bacia Amazonica e nas mattas densas e humidas das encostas das cordilheiras dos Andes e da America Central.

Tendo-se em frente uma collecção de Syntomideos, involuntariamente estranha-se a enorme differença no aspecto geral das diversas formas. Muitas especies são tão semelhantes ás vespas, com as suas azas hyalinas, sem escamas, o corpo coarctado e annellado de diversas côres que torna-se necessario um exame mais minucioso para constatar tratar-se d'uma borboleta e não d'um hymenoptero. Pousada n'uma flor, á primeira vista, mesmo o entendido no assumpto, pode enganar-se e tomar uma borboleta por vespa *. De outro lado temos formas escuras, de côres sombrias e modestas, porém a maioria é de especies de côres brilhantes, verdadeiras joias, com manchas d'um colorido azul ou bronze metallico e cintas no abdomen de um vermelho ou encarnado vivo. São em geral borboletas pequenas, tendo as maiores uns 30 millimetros no comprimento das azas.

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* Esta frizante semelhança com vespas serviu para os adeptos da theoria de "Mimicry" como exemplo classico, porem devo confessar que não me posso contentar com a idéa de que um insecto pela evolução possa alcançar uma semelhança com qualquer outro insecto, copiando um modelo que parece ser protegido contra certos inimigos, para com esta circumstancia auferir vantagens na lucta pela existencia.

A maioria das especies pode ser considerada como nocturna e a minoria como diurna, frequentando durante o dia diversas flores. Entre estas ultimas tenho observado que somente nas primeiras horas do dia apparecem nas flores e tornam-se muito ariscas mais tarde, desapparecendo completamente durante as horas quentes. Certas formas apparecem a noite á luz. No vôo são faceis de conhecer e todas as que tenho encontrado na matta voando, teem o costume de pousar no lado de cima de folhas, para esconder-se immediatamente no lado inferior dellas. Por esta razão a collecta de Syntomideos não é facil e se não tivesse encontrado uma planta que tem uma extraordinaria força attractiva sobre esta familia de Lepidopteros, a minha collecção até hoje seria pauperrima! Por acaso observei que a planta conhecida na nossa região como Fedegoso (no sul Crista de Gallo), *Heliotropium (Heliophytum) indicum*, uma *Borraginacea* que cresce até um metro de altura, com folhas asperas e pequenas flores azuladas em panicula comprida, é muito frequentada por Syntomideos, tanto de dia, como de noite. Por simples commodidade, visto não ter sempre a planta crescendo perto da casa, arranquei plantas inteiras para pendura-las numa cerca de arame junto a mesma. Momentos depois pousaram os primeiros Syntomideos e na primeira noite appareceram diversas especies, porém nos dias seguintes, já com a planta completamente murcha, a quantidade de Syntomideos que appareceu, principalmente a noite, era espantosa, juntando-se centenas de especimens! A planta, murcha e meia secca, exhala um cheiro exquisito que, approximando-se da planta, uma pessoa nota immediatamente. Com a progressiva seccagem do vegetal, o cheiro desapparece pouco a pouco e as borboletas começam a rarear, até faltar completamente. Dando-se o trabalho de retirar a planta do sol quente e regando-a a tarde antes de pendura-la novamente, a mesma pode servir como isca durante uns 10 dias. Desagradavel é o facto que o Fedegoso attrahe os Culicideos que perseguem o colleccionador impiedosamente. Durante o dia o Fedegoso tambem é frequentado por muitas vespas que o roem no talo, nas folhas e na panicula e são principalmente nas chagas que ahi se formam que as borboletas aproveitam-se para sugar a seiva do Fedegoso.

Syntomideos diurnos que frequentam o Fedegoso são: *Pseudosphex*, *Sphecosoma*, *Pompiliodes*, *Hyda*, *Eumenogaster*, *Trichura*, *Antichloris*, *Agyrta*, *Mesolasia*, etc. Nocturnos são: *Orcynia*, *Phoenicoprocta*, *Pheia*, *Loxophlebia*, *Leucolmemis*, *Cosmosoma*, *Episcepsis*, *Teucer*, *Desmotricha*, *Aclytia*, *Delphyre*, *Heliura*, *Eucereon*, *Hyaleucerea* e outros. Tenho observado que o maior numero de especies procuram o Fedegoso entre 7 e 8 horas da noite, sendo raro encontrar-se formas após ás 9 horas que já não se tenham observado antes. Verifiquei tambem que ás 4 e 5 horas da madrugada ainda se encontram as mesmas especies observadas na vespera. Noites de chuva deram sempre bons resultados, porém, absolutamente negativas, são as noites de luar, facto este que tenho observado em diversos lugares do Estado do Pará. Mesmo em tempo de lua cheia, se o céu fica completamente encoberto pelas 9 ou 10 horas da noite não se pode contar encontrar Syntomideos nas horas altas da noite, o que demonstra que estas borboletas somente voam logo depois do escurecer. Entre as formas diurnas tenho observado os generos *Agyrta*, *Xyridela*, e *Mesolasia* sómente nas primeiras horas do dia, emquanto que *Sphecosoma*, *Eumenogaster*, *Trichura* e *Antichloris* frequentam o Fedegoso durante todo o dia, mesmo nas horas mais quentes, tornando-se porém bastante ariscas.

Principiei a colleccionar Syntomideos em 1921 na nossa propriedade Taperinha, no Municipio de Santarém, á margem direita do Rio Amazonas. A nossa casa está situada na aba de um planalto de uns 120 metros de altura, a extremidade do planalto central do Brasil que vem morrer na beira do Rio Amazonas, completamente coberto de exhuberante matta virgem, tendo na sua frente, pelo lado septentrional, o vasto valle do grande rio, terrenos de campos alagados durante o inverno, entremeiados com ilhas da varzea. Em 1923 remetti duplicatas ao Dr. Hans Zerny do Museu de Vienna que me enviou a lista das especies classificadas. A lista continha 88 especies e entre ellas 4 novas. Em 1927 Zerny passou tres mezes como nosso hospede em Taperinha e colleccionou, entre milhares de insectos, cerca de 1.300 especimens de Syntomideos, representando 120 especies. Nos Annaes do Museu de Vienna, Vol. 45 de 1931, Zerny publicou a lista dos Syntomideos do Estado do Pará, conhecidos até aquella data, baseando-se, fóra da litteratura já existente, na minha collecção e na por elle feita durante a sua estadia aqui. Nesta lista, que contém 231 especies, 102 foram constatadas pela primeira vez no Estado do Pará.

Na presente lista o numero de Syntomideos encontrados neste Estado eleva-se a 260, não incluindo umas formas, provavelmente especies novas, que, pela falta da litteratura mais moderna, ainda não procurei classificar. Temos de tomar em consideração que até hoje muito pouca gente tem feito collecções systematicas de Syntomideos na nossa região, e no futuro, uma intensa exploração neste sentido ha de ampliar consideravelmente o numero de especies. As collecções feitas por Zerny e por mim são provenientes, na sua grande maioria, de Taperinha, por conseguinte do lado meridional do Rio Amazonas. Zerny chama a attenção para o facto de que de Obidos, no lado esquerdo do Rio Amazonas, apezar de ser uma localidade bastante frequentada por colleccionadores de borboletas, quasi nada se conhece de Syntomideos. Ferreira d'Almeida, durante a sua excursão aos rios Trombetas e Cuminá, de Agosto até Novembro de 1936, sómente encontrou 11 especies de Syntomideos, porém estou convencido que, se tivesse encontrado o Fedegoso, teria feito boa colheita. Até hoje não tive occasião de collectar no lado septentrional do Rio Amazonas e possuo sómente poucas especies da Bocca do Rio Parú, apanhadas pelo Dr. Allen Pickles e sua esposa D. Marjorie, entre ellas formas nunca encontradas em Taperinha. De 1931 para cá, voltando para o Museu Paraense como Chefe da Secção de Zoologia, tenho feito collecções em Itaguary e Breves, ambas localidades na Ilha de Marajó, em Santa Izabel e São Jorge de Jaboty (junto ao leprosario Paraense) na Estrada de Ferro de Bragança, como tambem nas immediatas visinhanças de Belém. De Miramar e de Mosqueiro (junto de Belém) tenho recebido do Dr. Eladio da Cruz Lima e sua esposa D. Esther, diversas formas não encontradas em Taperinha. Auxilio encontrei tambem por parte do meu assistente do Museu Paraense, Rodolpho Siqueira e do estudante Angelo Pinheiro. Valiosas contribuições para a minha collecção tenho recebido do meu jovem neto Werner, que já com a idade de 5 annos apanhava no Fedegoso Syntomideos, triumphando com cada novidade encontrada.

Para demonstrar a distribuição geographica das diversas especies fiz na minha lista annexa quatro rubricas: 1.ª) a lista dos Syntomideos conhecidos até hoje no Estado do Pará; significando o signal I nesta rubrica que possuo especimens na minha collecção; 2.ª) indica que a especie é conhecida (X) ou não (O) na região do Alto Amazonas e seus affluentes acima de Manáos, inclusive Bo-

livia, Perú, Equador e Colombia; 3.ª) que a especie é conhecida (X) ou não (O) nas tres Guyanas, incluindo parte da Venezuela, principalmente o Rio Caura, em vista das collecções feitas por Klages naquella região, e a Ilha Trindade; 4.ª) que a especie é conhecida (X) ou não (O) do Sul do paiz, desde o Estado do Maranhão, onde na sua parte septentrional finda a matta tropical da bacia Amazonica.

Das 260 especies de Syntomideos conhecidas até hoje no Estado do Pará, 46 especies são unicamente conhecidas neste Estado; 29 especies são conhecidas tambem no Alto Amazonas; 52 especies são conhecidas tambem nas Guyanas; 59 especies são conhecidas tanto no Alto Amazonas quanto nas Guyanas; 12 especies são conhecidas tambem tanto nas Guyanas quanto no Sul do paiz, faltando na região do Alto Amazonas; 7 especies são conhecidas tambem tanto no Alto Amazonas quanto no Sul do paiz, faltando nas Guyanas; 6 especies são conhecidas sómente no Sul do paiz, faltando tanto no Alto Amazonas quanto nas Guyanas e 31 especies teem uma distribuição geographica mais vasta, sendo encontradas em todas as regiões.

Pelos algarismos acima mencionados vê-se logo que a fauna do Estado do Pará tem muito mais formas communs com as Guyanas de que com a região do Alto Amazonas. Este facto, sem duvida, está em correlação com a vegetação e Adolpho Ducke, o melhor conhecedor da nossa flora, affirmou-me que a composição da matta do Baixo Amazonas tem muito maior semelhança com a das Guyanas do que com a do Alto Amazonas. Pelas observações da Commissão de Limites, trabalhando hoje nas fronteiras das Guyanas, sabemos que o divisor d'agua que separa as aguas que correm pelo lado do sul para o Rio Amazonas e as que correm pelo lado do norte directamente para o Oceano, está na maior parte coberta de uma densa matta virgem, não existindo assim obstaculo nenhum á distribuição franca de um para o outro lado.

Tomando em consideração a vasta distribuição geographica em geral, acho não errar muito, considerar a maior parte dos Syntomideos como polyphaga, alimentando-se as lagartas de uma mesma especie de diversas plantas. Devemos confessar que até hoje quasi nada se conhece sobre as lagartas desta familia e vae ainda demandar muita paciencia para se esclarecer um pouco a biologia deste grupo. O espaço de que disponho, não me permitte entrar em detalhes observados em diversas especies, sómente quero ainda mencionar a circumstancia de que muitas especies, apezar de apparecerem a noite no Fedegoso em grande abundancia, nunca as encontrei na matta durante o dia. Não falo das formas pequenas faceis de escapar a vista, porém das formas grandes, como *Orcynia calcarata*, *Desmotricha ursula* e o maior numero de especies do genero *Eucereon* que apparecem a noite no Fedegoso ás duzias de exemplares.

ESTADO DO PARÁ		Alto Amazonas, Bolivia, Perú, Equador e Colombia	Guyanas, Venezuela (Rio Caura) e Ilha Trindade	Sul do Paiz
1. *Phaeosphecia opaca* Wlk.		O	O	O
2. *Orcynia calcarata* Wlk.	I	X	O	O
3. *Pseudosphex polistes* Hbn.	I	X	X	X
4. *Pseudosphex klagesi* Rothsch.	I	O	X	O
5. *Sphecosoma angustatum* Moeschl.	I	O	X	X
6. *Sphecosoma testaceum* Wlk.	I	O	X	O
7. *Sphecosoma abdominalis* Schaus.	I	O	X	O
8. *Sphecosoma mathani* Rothsch.	I	X	O	O
9. *Pompilopsis tarsatis* Wlk.	I	X	O	X
10. *Pompiliodes aliena* Wlk.	I	X	X	X
11. *Pompiliodes postica* Wlk.	I	X	O	O
12 *Pompiliodes tenebrosa* Wlk.		O	X	O
13. *Methysia intersecta* Hmps.		O	O	O
14. *Methysia notabilis* Wlk.		O	X	O
15. *Paramya chrysonota* Hmps.		O	O	O
16. *Isanthrene metas* Cr.	I	X	X	X
17. *Isanthrene varia* Wlk.	I	X	O	O
18. *Isanthrene vespiformis* Butl.	I	O	O	O
19. *Isanthrene porphyria* Wlk.		X	X	O
20. *Hyda basilutea* Wlk.	I	X	X	X
21. *Autochloris caunus* Cr.	I	X	X	O
22. *Autochloris ectomelaena* Hmps.	I	X	O	O
23 *Autochloris completa* Wlk.		X	O	O
24 *Autochloris simplex* Wlk.		X	O	O
25. *Sarosa ignicornis* Hmps.		X	O	O
26. *Sarosa acutior* Feld.		X	O	O
27. *Phoenicoprocta chrysorrhea* Hmps.	I	X	O	O
28. *Phoenicoprocta vacillans* Wlk. *nigricoxa* Zerny	I	O	O	O
29. *Phoenicoprocta rubriventris* Hmps. *amazonica* Zerny.	I	O	O	O
30. *Pheia gaudens* Wlk.	I	X	X	X
31. *Pheia serpensis* Kaye.	I	O	O	O
32. *Pheia haemapleura* Hmps.	I	O	O	X
33. *Pheia albisigna* Wlk.	I	X	X	X
34. *Mimagyrta abdominalis* Rothsch.	I	X	X	O
35. *Loxophlebia picta* Wlk.	I	O	X	X
36. *Loxophlebia cinctata* Hmps.	I	O	X	O
37. *Loxophlebia crusmatica* Dogn.	I	O	X	O
38. *Loxophlebia pyrgion* Druce.	I	O	X	X
39. *Loxophlebia diaphana* Sepp.	I	O	X	X
40. *Loxophlebia klagesi* Rothsch.	I	O	X	O
41. *Loxophlebia postflavia* Druce.	I	O	X	X

ESTADO DO PARÁ		Alto Amazonas, Bolivia, Perú, Equador e Colombia	Guyanas, Venezuela (Rio Caura) e Ilha Trindade	Sul do Paiz
42. *Mesothen pyrrha* Schaus.	I	X	X	O
43. *Mesothen endoleuca* Druce.		O	X	O
44. *Mesothen desperata* Wlk.	I	O	X	X
45. *Chrostosoma echemus* Stoll.		O	X	X
46. *Chrostosoma dhamis* Schaus.		O	X	O
47. *Xyridela acroxantha* Perty.	I	X	X	X
48. *Leucotmemis dorsalis* Wlk.		O	O	O
49. *Leucotmemis varipes* Wlk.		X	O	?
50. *Leucotmemis margariphera* Butl.		O	O	O
51. *Leucotmemis tenthredoides* Wlk.		X	X	O
52. *Leucotmemis intersecta* Wlk.	I	X	O	O
53. *Leucotmemis torrida* Wlk.		O	O	O
54. *Leucotmemis ornatula* Wlk.		O	O	O
55. *Leucotmemis flavidior* Gaede.		O	O	O
56. *Leucotmemis nexa* H. S.	I	X	O	X
57. *Leucotmemis chrysonota* Hmps.		O	O	O
58. *Leucotmemis insperata* Wlk.		O	O	O
59. *Cosmosoma subflammum* Wlk.	I	O	X	X
60. *Cosmosoma auge* L.	I	X	X	X
61. *Cosmosoma metathoracium* Kaye	I	O	X	O
62. *Cosmosoma seraphinum* H. S.		O	O	O
63. *Cosmosoma contractum* Wlk.	I	X	O	X
64. *Cosmosoma chalcostictum* Butl.	I	X	X	O
65. *Cosmosoma batesi* Butl.	I	O	O	X
66. *Cosmosoma admotum* H. S. var. *confinis* H. S.	I	X	X	X
67. *Cosmosoma consolatum* Wlk.	I	O	X	O
68. *Cosmosoma restrictum* Butl.	I	X	O	X
69. *Cosmosoma telephus* Wlk.	I	X	X	X
70. *Cosmosoma achemon* Fabr.	I	O	X	O
71. *Cosmosoma tengyra* Wlk.		O	O	X
72. *Cosmosoma klagesi* Rothsch.		X	X	O
73. *Cosmosoma anoxanthia* Druce	I	O	X	O
74. *Poecilosoma chrysis* Hbn.	I	X	X	O
75. *Poecilosoma eone* Hbn.		X	O	O
76. *Mystrocneme varipes* Wlk.		O	X	O
77. *Dixophlebia quadristrigata* Wlk.	I	X	X	X
78. *Hypatia delecta* Butl.		O	O	O
79. *Hypatia melaleuca* Wlk.		O	O	O
80. *Rhynchopyga meisteri* Berg.		O	O	X
81. *Hypocharis clusia* Druce.	I	O	X	O
82. *Saurita cryptoleuca* Wlk.		O	X	O
83. *Saurita tristissima* Perty.		O	O	O

ESTADO DO PARÁ		Alto Amazonas, Bolivia, Perú, Equador e Colombia	Guyanas, Venezuela (Rio Caura) e Ilha Trindade	Sul do Paiz
84. *Saurita attenuata* Hmps.		O	O	O
85. *Saurita cassandra* L.	I	X	X	X
86. *Saurita tactcata* Butl.		X	X	O
87. *Saurita fusca* Dogn.		O	O	O
88. *Saurita temenus* Stoll.	I	O	X	O
89. *Saurita concisa* Wlk.	I	O	X	O
90. *Saurita tipulina* Hbn.	I	X	X	X
91. *Saurita lasiphtebia* Dogn.		O	X	O
92. *Sauritina dubiosa* Schaus.		O	X	O
93. *Micragyrta diminuta* Wlk.	I	X	O	O
94. *Psoloptera leucosticta* Hbn.	I	O	X	O
95. *Dycladia tucetius* Stoll.	I	O	X	X
96. *Syntomeida melanthus* Cr.	I	X	X	X
97. *Histiaca cepheus* Cr.	I	X	X	O
98. *Histiaea amazonica* Butl.		X	O	O
99. *Histiaea proserpina* Hbn.	I	X	O	O
100. *Macrocneme teucostigma* Perty	I	X	O	O
101. *Macrocneme chrysitis* Guér.	I	O	X	?
102. *Macrocneme adonis* Druce.	I	X	O	O
103. *Macrocneme thyra* Moeschl.	I	X	X	O
104. *Macrocneme maja* F.		X	X	O
105. *Macrocneme indistincta* Wlk.	I	X	O	O
106. *Macrocneme vittata* Wlk.		X	X	O
107. *Macrocneme ockendeni* Rothsch.	I	X	X	O
108. *Macroneme albitarsia* Hmps.	I	X	O	O
109. *Macrocneme acacus* Stoll.		O	X	O
110. *Calonotus phlegmon* Cr.		X	X	O
111. *Calonotus chalcipteurus* Hmps.		O	X	O
112. *Calonotus triplagus* Hmps.		X	X	X
113. *Calonotus acutipennis* Zerny.		O	O	O
114. *Calonotus angustipennis* Zerny	I	O	O	O
115. *Calonotus aequimaculatus* Zerny		O	O	O
116. *Mesolasia hemorrhoidalis* Stoll.	I	O	O	X
117. *Trichura cerberus* Pall.	I	X	X	X
118. *Trichura esmeralda* Wlk.		O	X	X
119. *Trichura latifascia* Wlk.	I	X	X	O
120. *Trichura coarctata* Drury	I	O	X	X
121. *Trichura mathina* Druce.		X	X	O
122. *Trichura aurifera* Butl.	I	O	X	O
123. *Pezaptera sordida* Wlk.		X	O	O
124. *Aethria andromacha* F. f. *rubra* Drt.	I	O	X	O
125. *Aethria aner* Hmps.	I	O	X	O
126. *Aethria stipata* Wlk.	I	X	O	O

ESTADO DO PARÁ		Alto Amazonas, Bolivia, Perú, Equador e Colombia	Guyanas, Venezuela (Rio Caura) e Ilha Trindade	Sul do Paiz
127. *Aethria leucaspis manca* Drt.	I	O	X	O
128. *Aethria daltha* Druce.		X	X	O
129. *Paraethria angustipennis* Rothsch.		O	O	O
130. *Paraethria mapiria* Drt.	I	X	O	O
131. *Hypocladia parcipuncta* Hmps.		O	X	O
132. *Hypocladia elongata* Druce.	I	X	X	O
133 *Herea metaxantha* Wlk.		O	O	O
134. *Herea ruficeps* Wlk.	I	O	X	O
135. *Eumenogaster notabilis* Wlk.	I	O	X	O
136. *Eumenogaster pseudosphecia* Hmps.	I	X	O	O
137. *Eumenogaster affinis* Rotsch.	I	O	X	O
138. *Urolasia brodea* Schaus.	I	O	X	O
139. *Metastatia pyrrhorhoea* Hbn.	I	O	X	?
140. *Abrochia (Chrysostola) discoplaga* Schaus.	I	O	X	O
141. *Abrochia (Chrysostola) aurantii-vena* Hmps.		O	O	O
142. *Abrochia (Chrysostola) postica* Wlk.		O	O	O
143. *Abrochia (Chrysostola) singularis* Wlk.		O	O	O
144. *Abrochia (Chrysostola) consobrina* Wlk.		O	O	O
145. *Abrochia (Chrysostola) mellina* H. S.		O	X	O
146. *Abrochia (Chrysostola) munda* Wlk.		O	O	O
147. *Abrochia (Chrysostola) fulviphex* Druce.	I	O	X	O
148. *Abrochia (Chrysostola) aequalis* Wlk.	I	X	X	O
149. *Abrochia (Chrysostola) zethus* Hbn.		O	O	?
150. *Ecdemus hypoleucus* H. S.	I	X	X	O
151. *Cercopimorpha homopteridia* Butl.	I	O	O	O
152. *Cercopimorpha dolens* Schaus.	I	O	X	O
153. *Teucer hypophaeus* Hmps.		O	X	O
154. *Teucer glaucopis* Feld.	I	X	X	O
155. *Teucer carmania* Druce.	I	X	O	O
156. *Teucer imbecillus* Zerny		O	O	O
157. *Epanycles imperialis* Wlk.	I	X	X	O
158. *Pterygopterus leucomelas* Wlk.	I	X	X	O
159. *Episcepsis melanitis* Hbn.	I	O	X	O
160. *Episcepsis lenaeus* Cr.	I	X	X	X
161. *Episcepsis nereus* Zerny	I	O	O	O
162. *Episcepsis scintillans* Rothsch.	I	X	X	O
163. *Episcepsis klagesi* Rothsch.		O	X	O
164. *Episcepsis gnoma* Butl.	I	X	X	X
165. *Episcepsis gnomoides* Schaus.		O	O	O
166. *Episcepsis lamia* Butl.	I	X	O	O
167. *Episcepsis frances* Dyar.	I	X	X	X

ESTADO DO PARÁ		Alto Amazonas, Bolivia, Perú, Equador e Colombia	Guyanas, Venezuela (Rio Caura) e Ilha Trindade	Sul do Paiz
168. *Episcepsis venata* Butl.	I	X	O	O
169. *Androcharta meones* Stoll.	I	X	X	O
170. *Androcharta diversipennis* Wlk.	I	X	X	O
171. *Ceramidia butleri* Moeschl.		X	X	O
172. *Ceramidia catalcuca* Butl.	I	X	X	O
173. *Ceramidia phemonoides* Moeschl.		X	X	O
174. *Antichloris intensa* Rothsch.	I	O	X	O
175. *Antichloris eriphia* Fabr.	I	X	X	X
176. *Antichloris scadderi* Butl.	I	X	X	O
177. *Pseudaclytia opponens* Wlk.	I	X	X	O
178. *Atyphopsis modesta* Butl.	I	X	X	O
179. *Sciopsyche tropica* Wlk.		X	O	X
180. *Napata walkeri* Druce.	I	X	X	O
181. *Napata alterata* Wlk.	I	X	X	O
182. *Napata melamelaena* Dogn.		O	X	O
183. *Napata leucoleta* Butl.	I	O	X	O
184. *Trichroa (Trichromia) capys* Cr.	I	X	X	O
185. *Lymire metametas* Wlk.	I	O	X	O
186. *Loxozona lanceolata* Wlk.		O	O	O
187. *Pseudosphenoptera boyi* Zerny.		O	O	O
188. *Xanthopleura perspicua* Wlk.	I	X	O	O
189. *Cyanopepla harama* Butl.		X	O	O
190. *Cyanopepla glaucopoides* Wlk.		X	X	O
191. *Desmotricha ursula* Stoll.	I	X	X	X
192. *Desmotricha albicincta* Hmps.	I	O	X	O
193. *Desmotricha klagesi* Rothsch.		X	X	O
194. *Desmotricha aurimacula* Schaus.	I	X	X	O
195. *Aclytia hoffmannsi* Rothsch.	I	X	O	X
196. *Aclytia hoffmannsi* Rothsch. f. *taeniata* Drt.	I	X	O	X
197. *Aclytia gynamorpha* Hmps.	I	X	X	O
198. *Aclytia heber* Cr.	I	X	X	X
199. *Aclytia reducta* Rothsch.	I	X	X	O
200. *Euagra caelestina* Stoll.	I	O	X	O
201. *Agyrta dux* Wlk.	I	X	X	X
202. *Agyrta micilia* Cr.	I	X	X	O
203. *Agyrta bifasciata* Rothsch.		O	X	O
204. *Agyrta auxo* L.	I	O	X	O
205. *Agyrta pandemia* Druce.		O	O	O
206. *Agyrta porphyria* Stoll.	I	X	X	O
207. *Ptychotrichos zeus* Schaus.	I	O	X	O
208. *Ptychotrichos ? fenestrifer* Zerny.		O	O	O
209. *Delphyre minuta* Moeschl.	I	O	X	O
210. *Dylphyre roseiceps* Dogn.	I	X	X	O

ESTADO DO PARÁ		Alto Amazonas, Bolivia, Perú, Equador e Colombia	Guyanas, Venezuela (Rio Caura) e Ilha Trindade	Sul do Paiz
211. *Delphyre maculosa* Hmps.		O	O	O
212. *Delphyre pusilla* Butl.		X	X	O
213. *Delphyre parcipuncta* Hmps.		X	O	O
214. *Delphyre varians* Hmps.	I	O	O	O
215. *Delphyre dizona* Druce	I	O	X	X
216. *Delphyre discalis* Druce	I	O	X	O
217. *Delphyre flaviventralis* Hmps.	I	O	X	O
218. *Delphyre flaviceps* Druce	I	X	X	O
219. *Heliura tetragramma* Wlk.	I	O	O	O
220. *Heliura rhodophila* Wlk.	I	X	X	X
221. *Heliura phaeosoma* Druce.	I	O	X	O
222. *Heliura hagmanni* Zerny.		O	O	O
223. *Heliura suffusa* Lathy	I	O	X	O
224. *Heliura zonata* Druce	I	X	X	O
225. *Heliura marica* Cr.	I	X	X	O
226. *Heliura postcaerulea* Rothsch.		X	X	O
227. *Eucereon archias* Stoll.		X	X	O
228. *Eucereon metoedesis* Hmps.	I	O	X	O
229. *Eucereon obscurum* Moeschl.	I	X	X	X
230. *Eucereon punctatum* Guér.	I	X	X	X
231. *Eucereon melanoperas* Hmps.	I	X	O	O
232. *Eucereon silvius* Stoll.	I	X	X	X
233. *Eucereon pseudarchias* Hmps.	I	X	X	X
234. *Eucereon latifascium* Wlk.	I	X	X	X
235. *Eucereon maja* Druce.	I	X	X	X
236. *Eucereon albidius* Rothsch.	I	X	O	?
237. *Eucereon marmoratum* Butl.	I	X	X	O
238. *Eucereon simile* Drt.	I	X	X	O
239. *Eucereon complicatum* Butl.		X	X	O
240. *Eucereon varium* Wlk.	I	X	X	O
241. *Eucereon amazonum* Rothsch.	I	X	X	O
242. *Eucereon exprata* Dogn.		O	O	O
243. *Eucereon aoris* Moeschl.	I	O	X	O
244. *Eucereon taperinhae* Dogn.		O	O	O
245. *Eucereon scyton* Cr.	I	X	X	X
246. *Eucereon parascyton* Hmps.	I	X	O	O
247. *Eucereon brunneum* Hmps.	I	X	X	X
248. *Eucereon fuscoirroratum* Rothsch.		O	X	O
249. *Correbia tristitia* Kaye		X	X	O
250. *Correbia felderi* Rothsch.	I	O	O	O
251. *Correbia lycoides* Wlk.	I	X	X	X
252. *Correbidia notata* Butl.		X	O	O
253. *Correbidia calopteridia* Butl.	I	X	X	O
254. *Correbidia germana* Rothsch.	I	X	X	O
255. *Ctenucha tapajoza* Dogn.		O	O	O
256. *Hyaleucerea vulnerata* Butl.	I	O	O	X
257. *Hyaleucerea erythrotela* Wlk.	I	O	X	O
258. *Hyaleucerea leucosticta* Druce.	I	O	X	O
259. *Hyaleucerea fusiformis* Wlk.	I	X	X	O
260. *Hyaleucerea lemoulti* Schaus.		O	X	O

Three parasites which habitually surmount our sanitary barriers

Maurice C. Hall

Chief, Division of Zoology, National Institute of Health, U. S. Public Health Service, Washington, D. C. — U. S. A.

The United States has a high social-economic level, and a sanitary level which is at least as high as that of any country in the world. There would be nothing gained by matching flaws in economic and sanitary performance in the United States against those in other countries in an attempt to measure superiority, since for the purposes of this paper, all that is claimed here is that we are safe in assuming a generally high level in the United States. Under such conditions, any parasites of man that succeed in surmounting the sanitary barriers erected here for the protection of the public health, in a country with a high standard of living, constitute special cases deserving special consideration.

Such special cases exist. There are three pathogenic parasites which most conspicuously do surmount our barriers, namely, trichina (*Trichinella spiralis*), the pinworm (*Enterobius vermicularis*) and the dysentery ameba (*Endamoeba histolytica*). Of these three parasites it may be said that they break through our lines of defense in large numbers, with a resultant high incidence in the United States, and that they do this largely because of peculiarities in their life histories in two cases, and, oddly enough, not in spite of, but largely because of, the prevailing high economic level in the other case.

In general, sanitary safeguards, such as provision for the safe disposal of feces by means of sewerage systems and soundly constructed privies and latrines, the cooking of food, competent meat inspection, safe water supplies, the use of clothing, shoes and gloves, and personal hygiene as attained through bathing, washing, laundering, modern house construction and similar things, protect mankind under modern urban conditions, and to a large extent under rural conditions, from a large number of parasite enemies, both animal and vegetable. This is so evident that we have assumed that these protective measures quite generally maintained an inverse correlation with the incidence of parasites, the incidence of parasitism decreasing as the number, quality and use of these measures increase. Yet it appears that this general assumption must be very definitely qualified in the light of our present knowledge. As illustrations, aside from the parasites forming the major topics of this paper, it is clear that the modern shower bath facilitates the spread of fungus infections of the foot, that the wearing of shoes helps to maintain such infections, and that wearing clothes favors the presence and spread of body lice. Of greater importance are the two worm parasites and the protozoan parasite discussed here.

Trichina (*Trichinella spiralis*)

About 50 years ago, there was a great interest in many countries in

the subject of trichinosis, and at that time there were many papers dealing with the subject. It is now clear that there were in those papers sufficient data to warrant conclusions that were not drawn, and other conclusions which were given only casual consideration and were then promptly forgotten. It was apparent that trichinosis was most prevalent in Germany and the United States, and that while, on the one hand, Germany had an impressive list of epidemics, on the other hand the United States had an incidence of trichinae in swine which in places reached such unusual proportions as 13 to 18 percent. It should have been clear that the detection of the epidemics in Germany was largely due to the fact that numerous German scientists, including such outstanding workers as Virchow and Leuckart, were interested in trichinosis and had interested the German medical profession, and that the lack of such outstanding leadership and general interest among medical men in the consideration of trichinosis in the United States might account for the much smaller number of cases of trichinosis known from this country.

Even making this allowance for American scientists and medical men, it is clear that the conclusions drawn from studies and investigations in the United States, conclusions which may be summarized as to the effect that trichinosis was a matter of minor interest, were conclusions biased by political and economic considerations. The matter of international trade was involved, and the old and recurrent phenomenon of countries trying to use fact material from the field of medicine to keep out competing products from outher countries, and the other countries trying to use the same fact material in rebuttal, is visible in what should be the unbiased product of published scientific work, as well as visible, as would be expected, in the state and diplomatic documents that were published. This same phenomenon is widely visible today in a world that is subordinating international trade to nationalistic ideology. It is a phenomenon which is almost invariably accompanied by something of misinterpretation of data and a tendency to stretch claims beyond the limits of sound conclusions adequately established by valid data. It is not necessary to raise the cry of «J'accuse» against our dead colleagues in science, most of whom have contributed in no small way to our knowledge, and who repaid to the world far more than the world paid to them. It is necessary only to point out that science failed to carry out its mission in the control of public health because the paralyzing hands of the politico and magnifico had been laid on it.

Nevertheless, as a consequence of pronouncements by American scientists and medical men, to the effect that trichinosis was a minor problem in the United States, the subject has been neglected for a half century, the idea has been generally established that trichinosis is a rare disease in the United States, our casual control measures, specifically directed against trichinosis, have accomplished little or nothing, so far as data are available, in lowering the incidence of trichinae in swine or man in the past half century, and hundreds of persons have paid with their lives for our neglect of this subject. A fair consideration of the data of 50 years ago and of the data obtained in the last few years shows that trichinosis is a major public health problem, involving, in some of its manifestations and to some extent, large numbers of persons, and that our future control measures must be of a different sort and extent from those of the past and present if they are

to be effective. Some of the data in support of this idea have been published by Hall and Collins (1937, I and II) and by Hall (1937, III and IV), and more will be published elsewhere, but it is proposed here to deal only with the factors which enable this parasite, trichina, to surmount the sanitary barriers established in a country with the high standards of living of the United States.

The two basic facts in connection with the occurrence of trichinosis in man in the United States are as follows: Human trichinosis rests on a base of swine trichinosis. Swine trichinosis rests primarily and predominantly on a base of uncooked or undercooked pork scraps in garbage, slops, swill and table scraps fed to swine.

The two measures for the control of trichinosis which have been invoked in the United States during the past 30 years are as follows: Such pork products as are customarily eaten without being cooked by the consumer, including salami, coppa, capicola, mettwurst, liverwurst, blood sausage, lachsschinken and a number of other products, mostly dry or summer sausages, of types developed in Germany and Italy, must be so processed, if they are prepared under inspection by the Federal Bureau of Animal Industry or any comparable inspection, that any trichinae present are killed by the use of heat, cold, or salting and smoking, at such temperatures and for such periods as have been shown to kill trichinae. There is no microscopic inspection of pork for trichinae in the United States. Our only precaution against trichinosis from pork of the sort customarily cooked takes the form of press releases, warning the public to cook pork thoroughly and to eat, without cooking, only such pork products as bear the Federal inspection stamp or the stamp of some equivalent local inspection. These releases are issued from time to time by the United States Department of Agriculture, State and local health authorities, and others, and are published in newspapers and other periodicals.

The evidence is convincing that trichina succeeds only too well in surmounting the barriers erected against parasites transmitted in meat when those barriers are of the order given above, i. e., the general national habit of cooking meat, meat inspection provisions for the destruction of trichinae in pork products habitually eaten without cooking by the consumer, and specific warnings to eat only such pork products as bear the stamp of competent meat inspection, and to cook thoroughly all other pork products and all pork. The data published by Hall and Collins (1937, I) and Hall (1937, IV) show that the incidence for trichinae in swine in the United States today is substantially the same as the incidence 40 years ago, and the data published by Hall and Collins (1937, I) show that there is certainly no drop in the incidence of trichinae in man.

The reasons for the failure of these measures to control trichinosis deserve consideration, and from such consideration we can ascertain why it is that, in a nation with a high sanitary and social-economic level, such a parasite as trichina can surmount the sanitary barriers which we have been prone to regard as effective in the control of parasites transmitted in meat. A consideration of our failure develops the surprising fact that another of our assumptions, namely, that parasitism in general decreases with a rise in the economic level of a country, must have an exception written against it,

and that we have reason to suppose that the incidence of trichinosis in any country may be expected to rise as the economic level rises. If this is true, then in those countries in which trichinosis now appears to be a minor matter some consideration might well be given to the likelihood that an economy of abundance in those countries, comparable to that in the United States, may well bring in its train a rising incidence in trichinosis unless adequate plans are made and carried out to prevent such an occurrence.

As regards the failures of our own control measures in the United States, we consider first the processing of meat products customarily eaten without cooking, in order to kill any trichinae that may be present. Of itself, this is a sound procedure. The flaw in the procedure follows from the fact that the Federal government inspects only about 70 percent of the animals slaughtered in the United States, and that there is comparatively little sound meat inspection aside from Federal inspection. As a result, the pork products of this sort served in hotels, restaurants and other eating places represent a mixture of safe products in some places and at some times, and of unsafe products, locally produced and either uninspected or inadequately inspected, in other places and at other times. It is rarely possible to ascertain from the sliced product, as served, whether it is safe or unsafe, since the stamp is either not present or on such slices is not preserved in any condition to be read, and the mixture, as such, is unsafe.

As regards the warnings to cook pork thoroughly and to avoid pork products customarily eaten without cooking by the consumer unless these originate in a packing plant under adequate inspection, an analysis of the population groups in which Hall and Collins (1937, II) found trichinae shows that among these groups are some which are comparatively illiterate and quite unlikely to read or understand even the popular accounts of such things as trichinosis, and others which are quite unlikely to see such press releases. A factor of even greater importance is the fact that eating habits are extremely individual, being conditioned by highly variable individual tastes, and this is clearly indicated by the fact that trichinae and trichinosis are found in groups of high social-economic status, including physicians and veterinarians who should be among those best informed on the subject of trichinosis, and who should best known how dangerous it is and how to avoid contracting it. The occurrence of trichinae in between 10 and 20 percent of 2,000 to 3,000 necropsy cases is ample evidence that many persons in the United States eat more or less raw or undercooked pork and unprocessed or inadequately processed pork products.

It has been stated repeatedly in the American literature on parasitology that the people of the United States like their beef rare and their pork well done, but there is convincing evidence that they actually eat a lot of raw or rare pork, and that our previous assumption to the contrary is a fiction that must be abandoned as fiction. The available data still indicate that Germans, Italians and the rural population contribute a relatively high percentage of our epidemics and of diagnosed cases of clinical trichinosis, a thing which may follow partly from the general belief that they are more likely to have trichinosis, which belief finds some sound basis, in the cases of Germans and Italians, in a racial fondness for such pork products as dry or summer sausages of various sorts, and in a tendency to make their own sausages. On

the other hand, the large majority of cases of trichinae infestation found post mortem are in native citiziens of so-called American stocks. the group which makes up by far the greater part of the population.

Accepting, then, the idea that eating habits are highly personal matters, we pass to a consideration of the fact that the incidence of trichinae, as ascertained at necropsy, varies in different sections of the United States. The incidence in the South is low. that along the northern Atlantic coast and along the Pacific coast is high, and that in the Middle West appears to be intermediate. The incidence in the Rocky Mountain States appears to be low, but the data for drawing definite conclusions are not yet available.

Assuming that eating habits are highly individual. Hall and Collins 1937, I) conclude that the incidence in any given region would vary with the extent of trichinosis in swine, following the law of chance in that the greater the incidence of trichinae in the swine from which pork is consumed, the greater the likelihood that consumers of pork would acquire trichinae from it. They correlate the high incidence along the coasts with the prevalence of the practice of feeding uncooked garbage to swine. a thing which results in an incidence of about 5 percent of trichina infestations in these swine. They correlate the intermediate incidence. about 1.5 percent. in so-called grain-fed swine in the Middle West with the prevalence of pasture- and grain-fed swine, in a region abundantly supplied with grain, which are mixed on the market with swine raised in pig pens and fed. in part, on slops and table scraps containing raw or undercooked pork scraps. They correlate the low incidence in the South, definitely less than 1 percent. with the fact that Southern swine are commonly run at large in the woods and fields. without garbage or slops. These correlations are sustained by data from the literature of 50 years ago and today. as summarized by Hall (1937. IV).

The basic source of trichinae in swine is the presence of raw or undercooked pork scraps in the food of swine. and all the available evidence indicates that trichinae in rats as a source of trichinae in swine may be regarded as of relatively little importance. If we inspect the route traveled by these pork scraps, from swine in the form of pork back to live swine. we find that the route begins with the discards that go into the garbage pail, and continues from there to the garbage-feeding plant and to the pig pens in which swine are fed slops and table scraps. This garbage pail deserves our attention. The people of the United States stand high among the nations of the world in amount of meat per capita purchased and consumed. Their general economic level is among the highest in the world. and is now generally designated by economists as an economy of abundance. a structure based on unsurpassed natural resources exploited by modern methods of production developed to a very high degree. As a result of this abundance, the people of the United States discard food stuffs to the garbage pail to an extent unparalleled elsewhere, and among the discards is a large amount of meat. The garbage-feeding industry, and the collection of garbage on which it rests, are themselves products of an economy of abundance, institutions which do not exist, or exist only in limited form, in an economy of scarcity.

This discarding of food stuffs is not to be interpreted as entirely a matter of waste, although there is a large, but not definitely ascertainable, amount of waste It follows largely from the fact that as standards of living rise, many

things that were used from sheer necessity, in spite of their unsatisfactory character, are no longer used, because there is no longer the necessity for using them. Where there is a scarcity of meat, necessity may require that every scrap be utilized in spite of spoilage or taint, even though public health considerations would require the rejection of such scraps. As the economic level rises, not only are matters of health taken into consideration, but esthetic considerations come into play, and meat which is discolored or otherwise objectionable will be discarded regardless of whether it is uninjurious or potentially dangerous to health. Hotels and restaurants will not be permitted to rework into food the material which has been served, regardless of whether it would be safe to cook it again and serve it a second time. Such considerations have a legitimate place in a civilized world, and will become operative anywhere whenever the economic level rises to the point at which they become functionally possible.

By contrast with the average American housewife, the average German, French and English housewife is thrifty. However, it is primarily a compelled thrift. Under the more crowded conditions in Europe, with economic uncertainty, expenditures for armaments in the midst of potential foes along their boundaries, and with much more limited natural resources, thrift is necessary. If and when that necessity passes, a generation or so will continue to follow the established patterns of its childhood, and then discriminating taste will develop new habits in discarding the unsatisfactory in the way of food, within the limits set by a greater prosperity. That has been the sequence of events in the United States. Under pioneer conditions, the American housewife retained the thrifty habits of her European homeland, and under improved conditions she lost them and established new habits. It is probable that there is no trichinosis in man in China, as the data indicate, since the data are supported by the fact that life at the low subsistence level of China does not permit of wasting such scarce and expensive food as pork by feeding it to swine under conditions of a scarcity of pork and food of all sorts for human consumption.

We arrive, then, at the somewhat surprising conclusion that the prevalence of trichinosis in the United States, with an incidence, as ascertained on the basis of trichinae found at necropsy, higher than that of any other country in the world, follows from a generally high level of prosperity as compared with that of other countries. It is, in effect, one of the prices we are paying for that prosperity. As already noted, it is a thing which runs counter to our established idea that the incidence of animal parasitism falls at the economic level rises, and is an exception to that rule which should be kept in mind and considered.

If the picture of trichinosis in the United States is as we have painted it, what are we to do to control trichinosis? For one thing, it is clear that any processing, under inspection, of pork products customarily eaten without cooking by the consumer, must cover substantially 100 percent of such products in a country if it is to function effectively as a protective measure. It is clear that we should cook pork thoroughly, and equally clear that in our present frame of mind and under present conditions we are not doing it and probably shall not do it to a much greater extent than at present. In all probability we shall require that the pork we buy be as safe as any

other food, and that the public shall not be required to protect its life and health by taking special precautions in dealing with what it assumes to be a safe and sound food. It is quite apparent that we shall not desist from discarding unsound or esthetically objectionable pork scraps. However, the swine industry must accept the responsability that legitimately attaches to producers of food, and it can and must desist from feeding these pork scraps, raw or undercooked, to swine. In garbage-feeding establishments garbage can be cooked to kill any trichinae present, and on the farm pork scraps can be kept out of slops and swill and fed to the chickens, or can be well cooked before they are fed to swine.

The one organized group which can bring about such improvements in swine husbandry with the minimum amount of difficulty and the maximum amount of efficiency is the group of packers. These business men are the purchasers of the swine growers' product. They can insist that the product they buy must meet certain reasonable specifications. And, by virtue of their exercise of the purchasing power, they can compel a compliance with such reasonable specifications. The need for such action on their part arises from certain cogent considerations. Court decisions applying the law of implied warranty to pork, even to pork of a sort customarily cooked before being eaten, have made the packer responsible in some places for damages in cases of trichinosis from pork originating in his plant, and these damage suits might become numerous and costly. The rapidly growing interest in trichinosis among scientists and medical men in the United States, and the high incidences found on necropsies, are certain to result in the development of better diagnostic procedures, and may well result in the detection of thousands of clinical cases annually instead of the 200 to 300 usually detected. Since swine are quite generally slaughtered before they are a year old, it is possible to obtain results in the way of a diminution of trichinosis in swine quite rapidly.

There is no longer any likelihood that the subject of trichinosis will again be misinterpreted and misstated at it was 50 years ago, and that interest will again die out under the soothing pronouncements of scientists and medical men attempting to protect an industry against legitimate criticism. This time the interest will continue, extensive studies will be carried out, and basic control measures will be undertaken. That public health can not be legitimately endangered because an industry wishes to indulge in unsound practices in food production seems beyond debate. The packers of the present day are aware of the actual and potential damage caused them by allowing the stigma of trichinosis to attach to pork, which is intrinsically a wholesome and appetizing food. They are in the mood to go to the root of the matter and remove the evil, and they will follow all the sound and practical advice that scientists and medical men can give them. There is no reason why they should not be assisted in this undertaking, and every reason why they should be encouraged in it. Any alternative — adverse legislation directed against the swine grower or the packer; unpleasant publicity which will frighten the public but will not control or eradicate trichinosis — is a less desirable alternative than that the packer be allowed and encouraged to undertake to educate and cooperate with the swine industry in developing practices which will eliminate the stigma of trichinosis from pork and the danger of trichinosis from the American people.

Pinworms (*Enterobius vermicularis*)

Some of the best parasitologists in the world have stated from time to time, over a period of many years, that pinworms are the most common of the helminth parasites of man, and there is ample evidence in support of the statement. Nevertheless, there is no helminth parasite of man, with anything like comparable importance, which has been more generally neglected as an object of scientific investigation and of medical practice, and no important helminth parasite about which so little is definitely known and so much vaguely surmised, and for which we have so little tangible and established information in regard to life history, pathology, symptomatology, therapy and prophylaxis.

This parasite is outstanding in its capacity for surmounting the sanitary barriers erected by modern civilization against parasites in general. It runs through all economic levels and enters the best social circles regardless of the sanitary, educational and cultural level of these circles. It does this by virtue of a peculiarity of its life history which turns it away from the route customarily traveled by worm parasites of the digestive canal in their movement from host to host, and turns it just at the time when following the customary route would have brought it under the influence of our control measures. Customarily the worm parasites of the digestive canal produce eggs which are deposited in the lumen of that canal and pass to the exterior in the feces, thereby coming under the influence of control measures providing for the safe disposal of feces through the use of sewerage systems and sanitary privies. The gravid female pinworm, on the other hand, stores its fertilized eggs in the uterus until that organ is distended with thousands of eggs and is so large that it displaces the digestive tract of the worm, crowding it against the body wall, and then the female migrates through the anus to the circumanal perineum and deposits its eggs on the skin near the anus or at variable distances from it. This maneuver definitely circumvents our control measures of the nature of safe disposal of feces, and the wide-spread and general occurrence of pinworms in man from the tropics to the polar regions indicates that our other control measures against parasites are also not operating effectively to protect us from this parasite.

The eggs deposited on the perineum have a position from which they may move out over a large number of lines of communication in proceeding to new hosts. The route most commonly mentioned is via the hands of the infested individual as a result of scratching to relieve the anal pruritis, or what is often reported as a stabbing pain in the region of the internal sphincter, which is frequently associated with oxyuriasis. However, anal pruritis is not invariably present, and other routes not necessarily associated with pruritis are those of contaminated underwear, nightwear, bedding, towels, wash rags and other things coming in contact with the anal region. When these eggs are recently deposited, they float readily, and as floating objects in bathtubs and swimming pools they may get on the hands and into the mouths of bathers and swimmers, with a resultant infection or reinfection. One of the most disturbing aspects of the matter is the fact, ascertained by such workers as Oleinikow (1929) and Lentze (1931; 1932), that these eggs, apparently in connection with drying or, at least, of losing their sticky quality, become capable of falling off the body and sifting through the meshes in clothing, and, consequently, they

become widely scattered in households on the floors, chairs, and rugs, and may sift through sheets and blankets down to a mattress. Lentze (1932) is of the opinion that air currents may carry these eggs about in such a way and to such an extent as to make air-borne infection a matter of some importance.

As a result of such a distribution of pinworm eggs, the presence of pinworms in one member of a family quite generally results in the infection of a majority of the members of the family, and infestation with pinworms is definitely a familial infestation. However, the gregarious human animal congregates in many places other than the home, and eggs falling from the bodies of pinworm carriers are distributed in schools, playgrounds, churches, stores and other places where people assemble. The parasite is spread dependably by virtue of such activities as visiting and going about the daily business of life on the part of patients that are quite generally ambulant patients. The eggs which are scattered about probably live for not more than 10 days, as a rule, being destroyed by drying, but the supply of eggs is constantly renewed.

As a result of the advantages of such a life history, pinworms hold their position as the most common and widespread of the worm parasites of man. Nevertheless, their presence is detected much less often than is the presence of the other and less common worm parasites, in spite of the fact that the symptoms associated with pinworm activities are more definitely indicative of the presence of this worm than are the symptoms associated with and indicative of most of these other worm parasites. The medical profession over practically the entire world is usually unfamiliar with the habits of the worm, and unacquainted with methods for diagnosing pinworm infestations. It is still quite generally believed that fecal examinations of the sort usually employed for the detection of worm infestations are suitable for the diagnosis of pinworm infestation, and the literature in the field of parasitology includes many papers giving the incidence of pinworms in population groups on the basis of fecal examinations, with no qualifying remarks to the effect that an incidence so obtained does not give any definite information in regard to incidence. Such incidences might represent 1 percent or 10 percent of the pinworm cases actually present in a group, since pinworm eggs may sometimes be present in feces as a result of female pinworms being trapped in fecal masses or flushed out in liquid stools, with the worms being broken up or depositing eggs after being passed, or eggs on the perineum may attach to fecal material in its passage, but such accidental findings throw little light on the subject of incidence.

While there are a number of papers dealing with the use of anal swabs and scrapers for the detection of pinworm eggs, the ordinary literature of the text books and reference books has little or nothing to say on this subject. Nevertheless, the only practical and generally useful method of detecting pinworm eggs is by the use of these swabs and scrapers. In a recent paper, Hall (1937) has discussed this subject, and has described a new swab, the NIH swab, which has a small square of cellophane attached by a rubber band to the rounded tip of a glass rod, the other end of the glass rod passing through a perforated rubber cork inserted in a test tube which serves to house the swab before and after use. The cellophane is rubbed over the anal and perianal region, and the cellophane then removed from the rod, transferred to a slide, and put under a coverglass, and its under surface examined through the transparent cellophane for pinworm eggs. The use of this swab reported by

the writer's associates, Bozicevich (1937; in press) in the examination of 230 boys, and Cram, Jones, Reardon and Nolan (1937) in the examination of over 600 persons from the general population, at Washington, D. C., shows incidences of approximately 31 and 35 percent, respectively, and while this is not a representative or random sampling, it indicates correctly that there is a very high incidence of oxyuriasis at Washington. This city has a sanitary and social-economic level unexcelled by any city of anything like comparable size, and the high incidence of pinworm infestation found here is simply additional evidence that the pinworm surmounts our sanitary barriers. What is true of Washington would be found true, in all probability, of any place at which equally extensive and careful studies were made, with some likelihood that much higher incidences would be found in most places, as they have been in a number of places.

Since the pinworm does surmount our sanitary barriers, more especially those providing for the safe disposal of feces, how can we defeat this worm? The lines of attack which have been laid down by various writers, on the basis of our previous knowledge, are definitely difficult and elaborate, and violate our general military principle that plans of battle must be simple to be successful. It is asking more than can reasonably be expected of ordinary human beings that they should be painstakingly careful and highly effective in such matters of personal hygiene as maintaining scrupulous cleanliness of the hands, fingernails, and anal region, that underwear, nightwear, bedding and similar things should be changed daily and the used articles laundered in such a way as to ensure destruction of pinworm eggs, and that the essential precautions necessary to ensure results be taken in employing cooks, waiters, nurses, governesses, clerks, etc. It is clear that we should have to add to these things the business of frequent cleansing to remove pinworm eggs from floors, chairs, rugs and other objects of furniture, that we should have and use individual towels and wash-rags, should sterilize bathtubs after use, and should avoid swimming pools. Such a program is not practical, and so long as we have no better and simpler program we shall see the pinworm continue to surmount our sanitary barriers, and must admit that at the moment we are defeated by the enemy.

The outlook is probably not so gloomy. One of the possible way of defeating an enemy that moves over so many lines of communication that we are unable to cut these lines with the artillery available to us, is to make a frontal attack that will destroy the enemy forces. This possibility has had consideration by the writer's associates, Wright and Brady (in manuscript) in the Division of Zoology of the National Institute of Health, and some works indicatea that the use of a suitable anthelmintic that can be administered three times a day over a period of 10 days will do much to defeat pinworms. Since most members of a family are infested, as a rule, whenever any are infested, it is first of all essential to ascertain which members are involved, and then essential that all those involved be simultaneously treated. Any failure in this matter commonly results in reinfection. The 10-day treatment appears to have two distinct advantages over a single treatment or a series of treatment of more limited extent. For one thing, the cecum and vermiform appendix are very commonly among the parts of the digestive tract infested with pinworms, and the use of many repeated doses of drugs is much more likely to ensure the entry of some of the drug into the cecum and appendix than is the use of one dose or

a few doses. For another thing, within the course of 10 days the pinworm eggs in the patient's environment are likely to be dead, and any infective material taken in by the patient during the course of the treatment is apparently killed by the anthelmintic.

At the moment, our best prospect of success in checking pinworms seems to lie in the realm of therapy, rather than in that of sanitation, but one may surmise that sanitation will be found to play a valuable role as an adjunct to therapy. In all probability, the use of vacuum cleaners around a home is of some value, perhaps of considerable value, in removing pinworm eggs and diminishing the likelihood of infection and reinfection. Good sanitary conditions must help to control pinworm infestation, at least to the extent of keeping it at a level below the level of infestation under insanitary conditions. The experience reported by Cram, Jones, Reardon and Nolan (1937), in an institution for boys, in which good sanitation prevailed, indicates that the level of incidence in the institution drops below the level of the incidence in the homes from which the boys come, as indicated by a general survey of all boys in the institution and by a survey at the time of admission of all boys subsequently admitted.

Ameba (*Endamoeba histolytica*)

Surveys conducted over various parts of the world indicate that although clinical amebic dysentery is a comparatively rare condition outside of the tropics, nevertheless, amebiasis, i. e., infection with *Endamoeba histolytica*, is a relatively common and widespread condition over the temperate zones. Although there has been much debate as to the degree of pathogenicity manifested by the ameba in these cases which lack dysenteric symptoms, it is the opinion of most well informed workers that the amebae must be regarded as definitely pathogenic, and their presence as something probably influencing the health and body economy unfavorably in some manner in practically all cases. At is assumed by some authorities that tropical amebic dysentery is primarily associated with infection following exposure under insanitary conditions to relatively large amounts of infective material, and that amebiasis of the type commonly found in the temperate regions is associated with infection following exposure under relatively good sanitary conditions to relatively small amounts of infective material.

How does this pathogen surmount our sanitary barriers? The answer to this question is by no means entirely clear, nor does it appear that what we know about amebiasis at this time is quite adequate for answering the question. The very fact that the ameba has a high incidence runs counter to our expectation that if a parasite uses feces as its line of communication from infected hosts to susceptible potential hosts, that parasite will be controlled by such control measures as the use of sewerage systems and sanitary privies providing for the safe disposal of feces. The ameba does use feces as its line of communication. Amebae may pass in dysenteric stools as trophozoites which must be of comparatively little consequence in the transmission of amebiasis from man to man, since these amebae usually die promptly, and are incapable of transmitting infection, as a rule, although it has been shown experimentally that infection can be transmitted by means of trophozoites to cats (Craig, 1905), to dogs (Swartzwelder, 1937) and to man (Walker and Sellards, 1913). However, the human animal is at least conditioned against contact with gross fecal

aggregates to the extent that he is not likely to acquire infection from direct contact with such masses, especially when they are freshly passed. In the vast majority of amebic infections, the amebae pass out as cysts in the feces, often in enormous numbers, and these cysts are the customary means of transmission of amebiasis.

The writer professes no great familiarity with the subject of amebiasis, having only casual acquaintance with amebic dysentery as seen in the American tropics and with amebiasis in its common manifestations in the United States. He has, further, no extensive knowledge of the enormous literature on amebiasis. However, from a limited knowledge of the subject matter, and from a specialized interest in the subject of control of parasites, he has arrived at certain tentative conclusions in regard to certain matters involved in control, which conclusions and the supporting evidence are given here for consideration. In dealing with theories and hypotheses, it is less important that the theories and hypotheses be right than that they be regarded as tentative ideas intended to stimulate thought and research on moot points, and something is usually gained by their presentation and subsequent investigation, regardless of whether they are sustained or disproved, accepted or rejected.

It appears that we must accept the idea that our control measures, in the way of safe disposal of feces by means of sewerage systems and sanitary privies, are actually effective in disposing of parasite eggs and cysts passed in feces, and that there is no large selective element in the action of these control measures by virtue of which ascarid eggs are disposed of effectively, with the resultant elimination of ascariasis from modern urban centers, but ameba cysts are not disposed of effectively, with the resultant persistence of amebiasis. No such selective screening action, retaining the ascarid egg and allowing the ameba cyst to pass trough, can be predicated. Obviously, the flaw is of a somewhat different order.

The precise point at which this flaw occurs seems to have been suspected, and more or less assumed to be present, in the literature on amebiasis, but the point is not definitely indicated in the treatises with which the writer is familiar. That it is not so indicated in the literature is something that could not be said with any confidence unless one had covered the extensive literature on amebiasis, and that the writer has not done. However, there is no need to show that ideas buried in the literature are not ideas at work, and if the writer's ideas exist in print elsewhere they are still worth printing if it brings them to the attention of those who can test their validity, and who would not otherwise do so.

In confining the discussion of flaws to a consideration of a high incidence of amebiasis under modern urban conditions, the writer excludes the matter of infection under rural conditions where the requirements of safe disposal of feces are not met. If flies can enter privies and carry fecal material on their feet to contaminate human food, or if soil pollution exists and there results contamination of soil, water and vegetables, then the matter of a parasite surmounting our sanitary barriers is not involved; the sanitary barriers either do not exist or are not of the modern types expected to be approximately 100 percent effective. Assuming that our high incidence results largely from infection acquired in cities, which is an assumption that may not be too sound, since it might result predominantly from exposure in rural areas, on vacations, or in

other extra-urban environments, our problem is: How do amebae evade the sanitary barriers erected in modern urban centers for controlling parasites which utilize feces as lines of communication from host to host? Where and how do they go through, over or around these barriers?

The answer to these questions is something implied in the literature on amebiasis in the common statements that amebiasis is transmitted by means of food handlers and the use of swimming pools. Quite obviously, it is not assumed that any considerable numbers of food handlers allow their hands to become grossly contaminated with feces, or handle foods with the hands in such condition, much less that they do this constantly or frequently. Equally obviously, it is not assumed that infected bathers in swimming pools contaminate the water with gross amounts of feces. It is reasonably obvious that the actual assumption is that there exists a certain amount of anal and perianal contamination with feces, which we know would often be the case; that this fecal material would contain ameba cysts in the cases of persons with amebic infections, which we found to be true by picking up ameba cysts on anal swabs (absorbent cotton on applicator) in the course of the study on oxyuriasis reported by Hall (1937); and that these cyst would occasionally get on the hands of food handlers when cleansing themselves after defecation, and would wash into the water of swimming pools from fecal material in the anal and perianal region of bathers having amebic infections.

These assumptions, as noted, actually exist in the literature as tacit and implied assumptions. It appears advisable to give these assumptions such direct statement as will lead us to focus on the assumptions, and to see what other consequences might follow from them. In the writer's mind, the first thought that follows from such assumptions is that we have here a situation comparable to that present in oxyuriasis, in which infective material present on the perineum is a first step in the movement of a parasite from an infected host to a new potential host. If this is the case, not only do we have the parallels between the cases of the oxyuriasis patient and the amebiasis patient so far as food handlers and swimming pools are concerned, but we have also the possibility that ameba cysts, like pinworm eggs, may be conveyed from person to person on underwear, nightwear, bedding, towels and wash rags, and by the use of bathtubs, wash basins, and similar things. Dr. Bertha Kaplan Spector informs the writer that the incidence of amebiasis was found to be high among laundresses in Chicago. The explanation given for this has escaped the writer, but it was not the explanation which he would regard as the probable one, and that is that laundresses would become infected from handling infected underwear, nightwear, bedding, towels and wash rags. In many parts of the world and over long periods in the year, there is sufficient atmospheric moisture to keep damp clothing, bedding, towels and wash rags damp for considerable periods of time, and under such conditions ameba cysts would probably survive a long time. We have found the eggs of ascarids, hookworms and whipworms also on anal swabs, but it is evident that our sanitary measures do control these worms, and this control may follow from a longer period necessary for development to infectivity and other factors which make perianal egg residua unimportant.

In the case of the ameba, as in the case of the pinworm, it appears that our measures for the control of parasites which move from host to host

via the feces are not defective in the sense that they do not safely dispose of infective material in feces committed to such constructions as sewerage systems for disposal. The vast majority of pinworm eggs do not get into feces, and while the vast majority of ameba cysts from up to 1,250,000 cysts per gram that may be present, certainly do get into feces, and are effectively and safely disposed of in sewerage systems, a residuum of cysts adheres to patients in the anal and perianal region, and probably does this so generally and in such numbers that these cysts serve to some large, but indetermined, extent to perpetuate amebiasis at a rather high incidence level even under the sanitary conditions of modern cities. This residuum of cysts left after the safe disposal of vastly larger numbers of cysts under modern sanitation apparently serves to perpetuate amebiasis in the form in which it is found in temperate regions, but is rarely large enough to give rise to amebic dysentery as found under the less sanitary conditions of the tropics.

Just how we are to defeat the ameba is not clear at this time. Undoubtedly, the subject of amebiasis requires much more research to develop the basic facts on which a control campaign could be outlined and shown to have considerable chance of effectively controlling the parasite. At this time, we can only say that we need more research, including a consideration of the possibilities suggested here, and that until we obtain new and useable information from research we shall have to depend on therapy, on the somewhat too elaborate ritual of a prophylaxis that requires such things as repeated examinations of food handlers, and on raising the general sanitary level, including the level of personal hygiene.

SUMMARY AND DISCUSSION

We do not yet have a basis on which we can give anything like a sound estimate of the incidence of trichina, pinworm and the dysentery ameba in man in any country, much less in the world. However, we can supply what is largely a subjective estimate, based to some extent on available, though inadequate, data, for the United States. The writer's estimate would be that in the United States the ameba would be found in approximately 10 percent, trichina in approximately 15 percent, and pinworms in approximately 20 percent of the population. Undoubtedly, all of these figures will have to be changed as we acquire more adequate data, but at this time it seems probable that the chance of revising the figures upward is quite as good as the chance of revising them downward; actually these figures lie somewhere in the middle range of available data.

As regards *E. histolytica*, Craig (1931) summarizes the results of 49,336 examinations in the United States, with infections found in 5,720, or 11.6 percent, and notes that this incidence approximates an estimate of 10 percent made by him in 1926.

As regards trichina, there are available to the writer the data, published and unpublished, on approximately 2,500 necropsy studies of trichinosis, and these shown an incidence of between 14 and 15 percent. At Washington, our base series of 1,000 necropsies to be reported by Nolan and Bozicevich (in manuscript) shows that 17.4 percent have trichinae; a series of cases of traumatic deaths, this series studied to check the possibility that the incidence in cases hospitalized for illnesses of all sorts would be higher than in nonhospitalized individuals, shows an incidence of approximately 14 percent on a series still

too small to establish a figure; and a series from hospitals widely distributed over the United States, selected at random from a list of approximately 700 hospitals having necropsy service, shows an incidence of over 15 percent on a still too small series.

As regards pinworms, studies being reported by the writer's colleagues, Bozicevich (1937) and Cram, Jones, Reardon and Nolan (1937), of the Division of Zoology, on over 800 persons, show incidences of approximately 31 and 35 percent, but these figures are based on examinations which were followed back to families whenever possible when any member of a family was found infected, and a liberal discount is made to take care of this overloading on the side of high incidence. On the other hand, our figures show that a much higher incidence is obtained with a series of 1 to 6 swabs than with 1 or 2 swabs, and most of our cases could be examined only once or twice, so our incidence for persons examined is actually low. For this reason, there is the possibility that our conservative estimate of 20 percent may have upward, not downward, revision.

As regards the extent to which these three parasites evade the sanitary barriers in other countries, not too much can be said. It has already been noted that in countries with lower economic levels there is a compelled conservation of pork scraps that are discarded in the United States, and that this fact is apparently correlated with a decreased incidence in trichinosis. However, no country has a series of recent necropsy studies comparable to those now available for the United States, and the claims that this or that country is free from trichinae, or has a very low incidence, are commonly not supported by adequate necropsy findings. There is ample evidence that the ubiquitous pinworm is present almost everywhere that man is present, and studies in which anal swabs were utilized would show interestingly high incidences almost anywhere. The loopholes in our barriers against pinworms are evident and are everywhere operative in the worm's favor. Amebiasis is especially prevalent and deadly in the tropics, largely because there are fewer and less effective sanitary barriers in the tropics.

As noted in the introductory remarks, parasites which can evade the sanitary barriers erected against parasites in the United States, and can break through in large numbers in spite of the high social-economic evironment here, constitute special cases and deserve special consideration. We have three such parasites in trichina, the pinworm and the ameba. Trichina surmounts our sanitary barriers in the United States, apparently, not in spite of, but because of, the high standards of living associated with an economy of abundance. The pinworm surmounts these barriers because of a peculiarity in its life history — the habit of depositing its eggs on the perineum instead of in the lumen of the digestive tract. The ameba surmounts these barriers, apparently, by virtue of a residuum of ameba cysts left after enormous numbers of cysts have been safely disposed of by sanitary measures, this residuum remaining in the anal and perianal region, and passing from there to new hosts via food handlers, swimming pools, underwear, bedding, towels, wash rags and other objects. So long as this trio can override the barriers we have set up for our protection, so long will it be evident that we do not yet have the requisite knowledge, ability or desire to protect ourselves from these pathogens.

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Studies on oxyuriasis. VIII. An effective therapy, the use of repeated doses of gentian violet administered orally.

Reproductive cycles of Raillietina cesticillus of the fowl

Paul D. Harwood

Zoological Division, Bureau of Animal Industry, U. S. Department of Agriculture — U. S. A.

While investigating the anthelminthic effects of kamala-nicotine preparations on the cestodes parasitic in chickens, it was noted that untreated chickens eliminated long pieces of strobilae. consisting mainly, or wholly of immature segments. This phenomenon was frequently observed in chickens infested with *Raillietina cesticillus*, *R. echinobothrida*, *R. tetragona*, and *Hymenolepis carioca*. There was little opportunity to make observations on the other species of cestodes known to infest chickens in this country.

The teniafuges used at the present time against poultry tapeworms will remove only the strobila, leaving the scolex still attached and in position to regenerate another strobila. Any possibility of benefit derived from these « desegmenting » drugs, becomes more remote if the same « desegmenting » effect is obtained spontaneously from time to time. The experiments reported in this paper were carried out to discover some of the factors governing the spontaneous shedding of strobilae by tapeworms, and to gather some data on the frequency of its occurrence. The investigation is by no means complete, but as the writer will have little opportunity to continue this work in the near future, the data already available are presented in this paper.

HISTORICAL

Extensive studies of the factors influencing the reproductive activity of parasitic nematodes have been made by numerous investigators, but the necessity of using an intermediate host to produce experimental infections with most trematodes and cestodes has discouraged similar studies with the latter helminths. Chandler (1923), Wetzel (1932) and Taylor (1933) have experimented with artificial infections of *Davainea proglottina* in laboratory raised chickens. Cram & Jones (1929), Jones (1931) and Wetzel (1934) have made similar experiments with *Raillietina cesticillus*. Since these authors were interested mainly in the life cycle and the developmental stages of the parasites, their recorded observations contain only incidental references to the intensity of, and the variations in, the reproductive activity of the cestodes studied. Stoll (1935, 1935 a, and 1936) has recently published a series of papers on *Moniezia expansa*, including data on reproduction, but as the life history of this parasite is unknown, he was forced to follow natural infestations which were complicated by simultaneously existing nematode infestations. Studies on mice experimentally infected with *Hymenolepis nana* have been made by Shorb (1933) and by Hunninen (1935) and these authors have observed phenomena very similar to those reported in this paper.

MATERIALS AND METHODS

Dung beetles, most of which belonged to the species *Aphodius granarius*, were collected from an experimental calf lot at the National Agricultural Research Center, Beltsville, Md. These beetles were infected artificially by feeding them ripe segments of *Raillietina cesticillus*. The first beetle was infected from one segment collected from the droppings of a bird which had been purchased in a Washington, D. C. market. This beetle was fed to chicken 1, and all subsequent infections of beetles made during this investigation were derived from segments passed by this chicken. After sufficient time had elapsed to permit full development of the cysticercoids, the beetles were dissected and the infective specimens fed to laboratory-raised chickens which were known to be helminth free; in certain instances, the cysticercoids were removed from the beetles and given to the experimental birds in saline solution.

The infections in the experimental chickens were followed for varying lengths of time by observing the ripe segments in the droppings. Each chicken was placed in a separate cage with a wire mesh floor that permitted the droppings to fall through the openings between the wires. The droppings were collected periodically and washed through a series of graduated screens, the last screen being of such fineness that the smallest segments could not pass through the mesh. The segments were then separated from the coarse fecal matter in the screens, and counted.

The chickens used were of mixed breeds that had been raised in wire cages in screened buildings. These conditions were sufficient to prevent all extraneous infections with helminths. During the experiments the birds were given a mash consisting of yellow corn meal, 40 pounds; wheat bran, 20 pounds; wheat middlings, 20 pounds; alfalfa leaf meal, 5 pounds; dried buttermilk, 4 pounds; fish meal (60 to 70 per cent), 4 pounds; pulverized oyster shell, 2 pounds; salt, 1 pound; and cod liver oil, 1 pound.

EXPERIMENTAL PROCEDURE

Experiment 1. — On October 19, 1934, a Plymouth Rock pullet, weighing 695 grams, was given one specimen of *Aphodius granarius* which had been artificially infected with *R. cesticillus* September 29, 1934. The first evidence of infection was on November 1, when 3 large ripe segments were passed in the feces. For the next 18.5 months the bird's feces were washed every day or so. During this period a total of 15,100 segments were collected, but the elimination of segments was an irregular roughly cyclical process, that was interrupted frequently.

A typical cycle began on December 5, 1934, when the feces contained no segments for the first time since November 1. Segments were again present December 7, and from this date the number of segments eliminated daily increased rapidly until December 20 when 199 segments were eliminated. From December 20 to January 8, 1935, the chicken eliminated an average of approximately 150 segments daily. On January 8, 13 chains of obviously immature segments were eliminated, and subsequent to that date the production of segments dropped rapidly to zero. No segments were eliminated between January 18 and January 28. This cycle was repeated many times in the 18.5

months during which the infection was followed. In general the cycles of segment elimination became much shorter, and the number of segments eliminated in one day were much reduced as the experiment progressed. Accordingly, the cycles became more frequent when no segments were eliminated, but the duration of such cycles was irregular. The longest cycle of complete cessation of segment elimination was from June 19, 1935, to July 27. 1935.

During the course of this experiment it was possible to obtain a rough comparative idea of the size of the segments passed, since large segments, could not be washed through the screen having 13 meshes to the inch, while small segments passed through this screen readily and were collected from the debris contained in the screen of the finest mesh (50 meshes to the inch). From December 20 to 25 all or nearly all of the segments were retained by the screen having 13 meshes to the inch. On January 3, 1935, it was noted that for the first time since December 15 none of the segments adhered to this screen. On January 5, two days after all segments first passed through the 13-mesh screen, three chains of immature segments appeared in the feces. A microscopical examination of the segments eliminated at this time showed that many of them were sterile. A few days later many chains of immature segments were eliminated and by January 18 the production of segments had ceased temporarily.

One accident marred the course of this experiment. On June 17, 1935, an oil stove near the chicken's cage exploded, and in the resulting fire the bird was badly burned. On the following day this bird has evidently eliminated several chains of segments, but the normal passage of feces had been so delayed, and digestion of the segments had advanced so far, that the count, as recorded for that day, was admittedly a compromise. The bird was severely affected by the burns, but recovered after appropriate treatment.

This experiment was terminated May 17, 1936, and at autopsy 3 tapeworms were found. The worms measured 4.6 mm., 31 mm. and 71 mm. in length respectively; the heads were attached at points varying from 5 to 7 cm. below the papilla of Vater; the small intestine from the papilla of Vater to the ileo-cecal valve was 107.8 cm. long.

Experiment 2. – Bird n.º 2 was given 1 infested beetle on February 25, 1935. Many fully-developed tapeworms were found in the intestine when it was opened February 18, 1935, but no small worms, or worms still in possession of their terminal segments were found.

Experiment 3. – On March 5, 1935, four chickens, which had been hatched February 16, 1935, were each given 1 cysticercoid of *Raillietina cesticillus* in physiologic saline. Only one of these chickens, bird 6, became infected. The feces of this chicken were examined for segments every day or so from March 5 to May 1. During this time the bird passed through one complete cycle in the elimination of tapeworm segments. The first segments were observed March 19, but the worm apparently did not reach full reproductive activity until March 22, when 7 segments were eliminated by the bird. By April 14 to 15 the period of active segment production had reached its climax, as the bird eliminated 17 segments during these two days and only one segment on the following day. After April 16 no segments were found in the droppings until April 30, when 5 segments were found. From March 22 to April 15, 270 segments were counted, an average of more than 10 segments per day. During

this period, the number of segments actually found in the chicken's droppings for any one day varied from 7 to 18, but there was no well marked peak of segment production.

The individual segments eliminated by chicken n.º 6 were all large, the majority being much larger than the largest of the segments eliminated by chicken n.º 1. Toward the end of the cycle the segments from chicken n.º 6 became somewhat smaller than those eliminated earlier, but the difference was not as well marked as with chicken n.º 1, nor was a chain of immature segments ever found in the feces.

Chicken n.º 6 was killed on June 11, 1935. One specimen of *Raillietina cesticillus* was found in the intestine. The head was attached to the intestinal mucosa at a point 12 cm. below the papilla of Vater.

Experiment 4. On April 5, 1935, each of 60 chickens was given 1 cysticercoid of *Raillietina cesticillus*. Of these chickens, n.ºs 7 to 25 were autopsied April 12, 1935. Of these, only numbers 13, 19, 20, and 22 were infested, each with 1 worm. Except for n.º 20, in which the worm was dislodged during the process of opening the intestine, the location of the point of attachment of the tapeworm was determined and is reported in table 1. The feces of bird n.ºs 26 to 66 were examined between April 20 and April 30, and infection detected in bird numbers 26 to 28, 38, 40, 41, 45, 50, and 66 which were autopsied on July 11. The remaining chickens were given an additional cysticercoid May 16, 1935. When these chickens were examined at autopsy on May 24, 1935, the numbers 35 to 37, 42, 43, 46, 47, 56, and 60 were found to be infected. The tapeworms found in 7 of the 9 birds still possessed the original terminal segment attached at the end of the chain of proglottids and probably represented adult worms developed from the cysticercoids given on May 16. As the tapeworms found in birds 35 and 42 lacked the original terminal segment, it is probable that these two infestations may have dated from the attempt to infest these birds on April 5, or 19 days previously. Therefore, chickens n.ºs 35 and 42 are not reported in table 1. Numbers 26 and 27 were killed in the fire in which bird n.º 1 was severely burned. These chickens were autopsied about 6 hours after death, but no tapeworms were found.

As shown in table 1, the chickens killed about 1 week after the date of infection are designated as group A; those killed a little over 3 months after infection as group B. The point of attachment of these worms relative to the length of the intestine, varied considerably, but when Group A is compared with Group B very little difference is found. In Group A the usual point of attachment was behind the papilla of Vater, being 13.8 per cent of the distance from this point to the ileo-cecal valve. The same figure for group B was 12.7 per cent.

Table 1. Attachment position of tapeworms found at autopsy in 1935 in chickens from Experiments 3 and 4.

Bird n.º	*Series*	*Date of infection*	*Date of autopsy*	*Length of intestine in cm.*	*Distance from point of attachment to Papilla of Valer in cm.*
13	A	April 5	April 12	69	10.2
19	A	April 5	April 12	43.8	8.2
22	A	April 5	April 12	51	8.6
36	A	May 16	May 24	83	11
37	A	May 16	May 24	84	14
43	A	May 16	May 24	77	11
46	A	May 16	May 24	81	11
47	A	May 16	May 24	95	13
56	A	May 16	May 24	89	14.5
60	A	May 16	May 24	90	0
6	B	March 5	June 11	91.2	12
28	B	April 5	July 11	114.9	12.2
38	B	April 5	July 11	94.5	11.3
40	B	April 5	July 11	92	16.6
41	B	April 5	July 11	95.3	16.4
45	B	April 5	July 11	81.7	7
50	B	April 5	July 11	96.5	10.3
66	B	April 5	July 11	91	10.3

DISCUSSION

The observations on bird n.º 1 show that a chicken may maintain an infection with *Raillietina cesticillus* for at least 18.5 months, but that not all individual tapeworms of this species live that long. Jones (1931) reported that an experimental chicken lost its infection within 5 months, and Wetzel (1921) reported that an infection of *Raillietina cesticillus* was retained by one of his experimental chickens for nearly four months. A second bird studied by Wetzel had passed segments but was negative for *R. cesticillus* on post-mortem examination 121 days after the date of infection. The writer has observed that chickens purchased in the Washington market during March were much less heavily infested with tapeworms than chickens purchased during September and October. This pronounced seasonal variation indicates that the average length of life of *Raillietina cesticillus* is a matter of a few months, perhaps 5 or 6, and not one or two years, as indicated by experiment 1. Furthermore,

if the number of segments eliminated are taken as a measure of the degree of infestation, bird n.º 1 had more than 3 tapeworms early in the infestation period, but lost them gradually during the course of the experiment. This is based on the following calculation. Bird n.º 6, which had only 1 tapeworm, eliminated on the average 10 segments a day during the height of segment elimination, whereas chicken n.º 1 eliminated approximately 150 segments daily. It may be assumed, therefore, that bird n.º 1 was originally infected with about 15 tapeworms, most of which were lost before the experiment terminated.

The most interesting phenomenon observed in these experiments is the occurrence of cycles of segment production along with the correlated manifestations of decreased segment size, and the elimination of unripe chains of segments. That these cycles were not peculiar to bird n.º 1, was concluded on the basis of experiment n.º 3 and of 4 chickens used in connection with another experiment which will be reported in another paper. The factors governing these cycles are by no means clear. If this cyclical behavior is inherent in the cestode, we may look upon that portion of the cycle showing small, sometimes sterile segments as a period of temporary senescence which terminates in the elimination of the segment chains. A short time after this the tapeworms undergo a period of rejuvenation and begin a new period of active reproduction. Alternating periods of senescence and rejuvenation, occurring naturally in the same individual, are rare in the animal kingdom, if they occur at all.

The cycles may be expressions of some form of resistance or immunity on the part of the host, but it is difficult to explain the destruction of a part of the parasite lying within the lumen of the digestive canal, while the head attached to the mucosa and in more intimate contact with host tissue remains alive and apparently unaffected.

The locations of the tapeworms found at autopsy in experiment n.ºs 1, 3, and 4 indicate that these worms are not forced by a local immunity to release their hold on the mucosa from time to time, and to reattach at some point lower down.

Hunninen (1935) found that tapeworm egg elimination from mice infested with *Hymenolepis nana* was interrupted and renewed, in a manner similar to that ocurring in chickens infested with *Raillietina cesticillus*. Hunninen interpreted this interruption as being due to the tapeworms becoming mature at various times. He believes that with any one infection with *H. nana*, the cysticercoids leave the intestinal mucosa at various times, and that the first ones to enter the lumen of the intestine develop rapidly to egg production, and the products of their growth or the host's reaction inhibits the development of later arrivals. When the first worms age and die the inhibited individuals develop to take their place. Hunninen believes also that this replacement is gradual in some hosts, and accounts for long periods of continuous elimination of eggs, while in other cases the replacement is discontinuous; the first tapeworms dying before the replacements are fully mature. Experiments 2 and 3 reported in the present paper show that his theory is not a tenable explanation for the phenomenon observed with *Raillietina cesticillus*. In bird n.º 2 no immature tapeworms to serve as replacements were present at the time of autopsy 13 days after the date of infection, and in bird n.º 6, phenomena very similar to the cyclical behavior observed in bird n.º 1 were present although this

bird was known to be infested with only one tapeworm, and replacements were impossible.

SUMMARY

A Plymouth Rock pullet was infected with *Raillietina cesticillus* and the infection followed for more than 18 months. During this period, segment elimination as a whole gradually declined; the decline was not regular, but was marked by periods of intense segment elimination, alternating with periods in which no segments, or only relatively few segments were eliminated.

Along with these cycles, the cestodes exhibited other phenomena. At the beginning of a cycle the segments were large, and well filled with eggs. The segments gradually became smaller, contained fewer eggs, and a few sterile segments were eliminated. This phase of the cycle was abruptly terminated by the elimination of chains of obviously unripe proglottids, and for a time the infested bird eliminated few or no segments. This period of a low rate of elimination of ripe segments was sometimes of a very short duration, but sometimes extended for several weeks.

The author has no explanation for the mechanism regulating these cycles but as it was shown that the same cycle occurs in cases where only 1 tapeworm is involved, the replacement theory of Hunninen does not apply to *R. cesticillus*.

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Em prol da catalogação da fauna do Brasil

Rodolpho von Ihering
Instituto Biologico de S. Paulo,
Commissão Technica de Piscicultura do Nordeste – Brasil.

Obedecendo á contingencia humana, tambem os biologos são escravos da moda. Tempos atraz, para não recordar senão a historia mais recente, todo bom trabalho de systematica devia ter por finalidade traçar a arvore phylogenetica do grupo estudado, muito embora essa architectura tivesse por base apenas a seriação dos grupos predominantes de determinado caracter.

A escola haeckeliana passou de moda e, como conclusão logica, ninguem mais deveria, de então para cá, expandir suas impressões phylogeneticas, sob pena de ser ridicularizado e taxado de passadista. A anatomia, a ecologia, a genetica, a physiologia, etc., tiveram, cada uma por sua vez, o predominio. A' influencia da moda só escapavam os mais independentes ou quem, constrangido pelas circumstancias, fosse obrigado a cuidar de estudos menos actuaes.

A systematica, classificando e dando nomes aos seres animaes e vegetaes, por longo tempo resistiu á injuncção da moda, devido talvez, ao nimbo que confere o « n. sp. », envolvendo homenagem e immortalizando um nome proprio. Por fim, porém, nos dias que correm, a systematica perdeu a popularidade de que sempre gozou; não diremos que fosse por influencia unica ou maxima da moda, parecendo-nos antes que a critica deve tomar em consideração circumstancias que permittem apontar fraquezas constitucionaes como causa da debilitação. Dois são os males principaes da systematica: Devido á demasiado lenta applicação das regras, a confusão que reina na nomenclatura desacreditou o trabalho do systematista nos circulos visinhos e, a rotineira ingenuidade, que apenas attende ás pequenas discrepancias de forma, côr ou medida, deu um cunho philatelico á preoccupação de descrever especies novas.

Se a nomenclatura suspirava por uma estabilisação definitiva, que, porém, depende não só da unificação internacional mas principalmente de um grande dispendio de energia e de verbas, a directriz principal, a cargo da classificação propriamente dita, necessitava de coordenação e espirito critico. Muito mais facil teria sido dar á nomenclatura um cunho de trabalho duradouro, do que fazer surgir quem estabelecesse normas para a delimitação de generos e de especies. Ainda que aquella funcção dependa do criterio desta, o nome, numero ou symbolo poderia ter estabilidade, por ser de origem convencional; mas o criterio para a disjuncção de uma serie supposta continua e natural, será sempre variavel, por ser artificio que não se coaduna com a finalidade visada.

Continuar o trabalho, com collaboradores que pela maior parte não comprehendem a finalidade? Parar? Ou estas duas alternativas ou uma remodelação completa, com bases mais solidas.

Não surgiu ainda quem pudesse encabeçar um movimento salutar, mas

já ha precursores, cujos argumentos prepararão o terreno para a futura reorganização.

Tem decrescido enormemente o numero de taxonomistas; a não ser nos museus, não se lhes offerecem mais possibilidades de trabalho e por isto na Europa e nos Estados Unidos os estudantes de biologia só procuram aquelles ramos das sciencias naturaes que lhes assegurem collocações.

Nós brasileiros, ou digamos os sulamericanos em geral, devemos encarar taes questões não só do ponto de vista geral, mas tambem com relação ao que se torna necessario para nosso progresso, dada a pobreza de nossa bibliographia biologico-systematica.

Nas presentes considerações nos limitaremos a citar exemplos da zoologia, mas ao botanico será facil adduzir outros tantos casos analogos, escolhidos de entre especimens da flora.

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Tomando em consideração sómente os trabalhos publicados em portuguez, a bibliographia faunistica do Brasil é pauperrima. Querendo arrolar, em livro didactico, apenas os trabalhos de caracter monographico, tivemos de fazer concessões para formar uma lista de 50 estudos dessa natureza. E' evidente que não pudemos dispensar taes cadastros, para, na base desses conhecimentos, cuidar de outros problemas relativos á fauna do paiz. Quer se tenha em vistas assumptos biologicos de alcance economico, quer os themas sejam de outra ordem, a inquirição inicial terá sempre por base a identificação da especie. Quando mais não seja, este nome nos servirá de chave para a inquirição bibliographica em busca de esclarecimentos, que nos podem poupar a repetição de experiencias já feitas.

Mas as difficuldades para a elaboração de catalogos faunisticos, no Brasil, são enormes, diriamos quasi invenciveis. Se dividissemos a fauna brasileira de tal forma que cada conjuncto pudesse ficar a cargo de um só especialista para completa elaboração da respectiva monographia, seria necessario contractar, por toda vida e com tempo integral de trabalho, nada menos de 30 a 40 systematistas. Além disto as condições actuaes de nossas bibliothecas zoologicas — a bem dizer meia duzia ao todo — de modo algum permittem, ainda que reunidas em um só bloco, a execução de tal trabalho. Seria necessario decuplicar talvez a melhor dellas, e depois de completada, fornecer-lhe os meios (por alto, uns 500 contos annuaes) para mantel-a em dia. Calculemos qual deva ser a literatura ichthyologica, necessaria para o trabalho completo e independente. A «Bibliography of Fishes», de Dean abrange cerca de 35.000 citações. para as questões geraes e as neotropicas em particular poderiamos contentar-nos com uma terça parte desse total, ou sejam 11.600 fichas. O livro acima citado, porém, data de 1916 e, nos 20 annos subsequentes foram publicados talvez quasi outros tantos trabalhos indispensaveis, o que elevaria o total a 20.000 fichas.

Pelos calculos a que nos temos referido em outras occasiões, a fauna brasileira representa em geral 1/11 da fauna mundial. Esta orça em mais de 500.000 especies descriptas e, na proporção acima exemplificada pela bibliographia ichthyologica, o fichario geral, para a bibliotheca que imaginamos, deveria abranger 500.000 fichas, desprezadas as fracções.

ducção. E quando. depois de encarada sob todos esses pontos de vista, a especie estudada, tiver fornecido material para ampla monographia, eis que surge a genetica, pela qual é possivel realizar pequenos milagres, revolucionando a questão.

Na nossa jornada zoologica, pouco importa se detidos pela classificação de insectos. peixes ou aves, sempre procuramos na ecologia a applicação da systematica e nos estudos que hoje nos preoccupam, ampliados agora com a finalidade practica da creação, gostariamos poder dar por terminada toda a tarefa acima esboçada, para recomeçar, dando toda attenção á genetica.

Como já o dissemos. a inclinação natural de cada um, subordinada ás contingencias. e ás vezes tambem a circumstancias fortuitas, darão as directrizes do trabalho.

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Encarada de um ponto de vista mais amplo. já com tendencias philosophicas, a systematica perde por completo a aridez de mera catalogação. Relegando a um plano inferior a preoccupação do nome a ser dado. e como defender-lhe a estabilidade, a inquirição transforma-se em trabalho equivalente ao do pesquizador que por outra forma busca o conhecimento das coisas em si. Foram os paleontologos que primeiro chamaram a attenção dos biologos para as transformações que soffre a serie animal e tem cabido áquelles as mais bellas demonstrações neste sentido.

A propria systematica pode, no emtanto, coordenar seu material de tal forma a nos esboçar e por vezes tornar bem patentes bellas series egualmente convincentes. Em se tratando, porém, de trabalho de filigrana, é preciso o maximo rigor na comprehensão dos valores e é neste ponto que ainda divergem os muitos artifices que cooperam.

Taes divergencias, assignaladas como sendo simples manifestação da tendencia natural de cada especialista. costumam ser classificadas, jocosamente, na gyria dos systematistas, como «lumping» (congregar) e «splitting» (dissociar). Verifica-se, porém, que tal antagonismo é a expressão da incerteza quanto a amplitude que dêva ser dada á concepção de especie, genero ou familia. E' tido ainda, por muitos, como prova de differença especifica o não-cruzamento ou a producção de hybridos infecundos. Ha provas em contrario, que porém podem tambem ser invocadas como excepções confirmadoras da regra; em todo caso esse criterio de algum modo nos é util na avaliação das affinidades. Mas ficaremos para sempre adstrictos a tão complicado methodo para a verificação da consanguinidade? As experiencias neste sentido só ultimamente foram intensificadas e promettem bons resultados.

Mais facil tem sido a demonstração de que muitas vezes se trata de mero polymorphismo e não de duas ou mais especies apparentemente distinctas. O ambiente provoca frequentemente transformações que induzem o systematista incauto a desmembrar em especies distinctas o que em realidade proveio da mesma origem, com possibilidade de retornar á forma ancestral.

Neste sentido, envolvendo tambem reflexões outras, relataremos a seguir alguns exemplos. O Nordeste brasileiro, com seu feitio tão marcadamente influenciador, offerece casos interessantissimos, que bem mereceriam mais demorada investigação.

— Ao prof. Travassos enviamos ha tempos exemplares de *Syntomideos* que, ao serem encorporados á collecção, vieram preencher uma lacuna do typo de um «missing link» —, e deste modo as tres formas, apparentemente distinctas, agora dispostas em serie sem interrupção, se apresentam como uma especia unica, com tendencias para esta ou aquella modificação.

— Ao Dr. F. Haas, malacologista de renome e que durante alguns mezes foi hospede da C. T. P., em Fortaleza, devemos os seguintes esclarecimentos aliás já publicados em 1930 (Bibl., pg. 175, 177). A mesma especie de molluscos offerece conchas de aspectos bastante differentes, de accôrdo com o ambiente em que viveu e cresceu; assim, o pantano, o lago, o rio, o riacho, cada um destes ambientes determina conformações diversas no contorno, na esculptura, na côr, na conchina, na estructura da charneira e na proporção das dimensões. Subsistem alguns caracteres constantes, mas os demais são «larvados», como já Rossmaessler (1850) denominava taes peculiariedades morphologicas devidas ao ambiente.

São «formas ecologicas», no dizer do Dr. F. Haas e que podem induzir o especialista menos cauteloso a descrevel-as sob outros tantos nomes especificos ou subespecificos, quando de facto lhes deve caber um só nome.

Sem duvida essa condensação da nomenclatura é util em se tratando, por exemplo, de themas zoogeographicos. Existe, porém, o perigo do excesso, o qual, levado para além das affinidades naturaes, causa damno talvez maior, pela suppressão das subregiões que assim não mais encontram documentação, a não ser pelos grandes contrastes.

— Da mesma forma o Dr. Francis Drouet nos communica que o material por elle colligido, ao acompanhar os trabalhos da C. T. P. no Nordeste brasileiro, veio provar que tres especies do gen. *Neptunia*, até agora consideradas distinctas, nada mais são do que adaptações da forma unica a tres ambientes differentes: no secco, na humidade e em aguas mais profundas.

— O Dr. Stillman Wright, limnologista da C. T. P. e especializado ha longo tempo na systematica dos Copepodos do grupo *Diaptomus*, em 1927 fez a revisão das especies sulamericanas do genero principal; consignára elle, então, 22 especies para a America do Sul. Agora, apóz proveitosa permanencia entre nós, reconheceu mais 10 especies e, sommadas tambem as que foram descriptas por outros autores, a lista total se eleva a 47 especies. As facilidades que encontram taes microcrustaceos para sua distribuição, não impedem, no emtanto, o reconhecimento de zonas, talvez com limites geographicos bem frizantes. Para este genero o ambiente nordestino não parece actuar com o rigor acima apontado; encontram-se *Diaptomus* na grande maioria das aguas do Nordeste e communmente existem em grande abundancia, mesmo em aguas não fertilizadas por exgottos, etc. Nas regiões em que não ha rios permanentes, o numero de especies parece ser menor do que em outras partes do continente, quando atravessadas por grandes systemas hydrographicos, como o Amazonas, e o Prata; tal differença, porém, não subsiste, quando se compara o Nordeste com o Estado de São Paulo, por exemplo.

— Os conhecidos peixes «Cascudos» (fam. *Loricariideos* principalmente do gen. *Plecostomus*), tem o corpo protegido por carapaça dura e além disto são abundantes os espinhos, reunidos em tufos. Taes defezas, tem se dito, são o indicio da senilidade da familia, e tambem ao exaggerado proliferar das especies se attribue egual significação; os Ammonitas e os Glyptodontes das éras

passadas parecem comproval-o e tal theoria foi amplamente discutida e illustrada por Child e principalmente por Beecher (1901) e Fenton (1931). Podemos no caso dos *Plecostomi* applicar egual raciocinio? De facto, a armadura é estranha, assim como muitos outros caracteristicos desses curiosos peixes, a que se é tentado chamar de «fosseis sobreviventes», como ao esturjão, e ao *Limulus*.

Mas a extraordinaria multiplicação das especies de cascudos só se verifica fóra da região nordestina. Tanto no systema do rio da Prata como na Amazonia e mais para o Norte, cada pequena bacia hydrographica apresenta varias especies, que alli vivem em conjuncto. Aqui, nos açudes do norte do Ceará só se encontra uma especie, *Pl. plecostomus*, homogenea, sem variações. O Dr. Pedro de Azevedo, inspector da C. T. P. tem concluido um estudo detalhado a respeito deste peixe sobremodo interessante; não entraremos por isto em detalhes relativos á embryologia e ecologia do *Plecostomus*. Apenas mencionaremos esse curioso facto relativo á immutabilidade da especie, aliás a de mais ampla distribuição geographica. Parece plausivel attribuil-o á influencia do ambiente, mormente como, na mesma região ha muitos outros casos analogos que, uma vez arrolados, deverão ser estudados em conjuncto.

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Os poucos exemplos acima citados, de entre muitos casos analogos da actividade da C. T. P. no Nordeste brasileiro, bem demonstram que as condições especiaes do ambiente, apezar de constituirem verdadeira antithese do que se observa na Amazonia, ainda assim proporcionam farta messe ao biologo.

Aqui exporemos apenas em linhas geraes a documentação que taes estudos nos estão fornecendo para a seguinte these: *O Nordeste não é favoravel á multiplicação das especies; poucos são os generos caracteristicos da região.* Ao procurar a razão de ser desse facto, depara-se com a alternativa: *ou um factor endogeno, attribuivel ao genotypo ou um ou mais factores exogenos, caracteristicos do ambiente, são os responsaveis.*

Uma das alternativas, por fugir de todo ao thema em torno do qual aqui discorremos, será esboçada apenas nos sêus traços geraes: E' de suppôr que o Nordeste foi outrora mais favorecido pelo clima, offerecendo então possibilidade para a existencia de uma fauna muito mais variada; depois, com a repetição e intensificação das seccas, a maioria das especies, e por certo todas as mais frageis, desappareceram, subsistindo sómente as especies mais ubiquitarias e (por isto mesmo?) mais estaveis.

Desta forma estaria explicada, ao mesmo tempo, a pobreza da fauna actual e tambem o predominio das especies de vasta distribuição. Em tudo isto teria predominado a influencia de factores exogenos.

Ha porém motivo para se invocar tambem a interferencia de um facto endogeno e, para discutil-o, voltamos ao thema principal deste capitulo.

Ha tempos já nos preoccupava o facto de verificarmos o contraste existente entre o que convencionamos chamar: *especies estaveis* e *especies plasticas*. No Instituto Biologico de São Paulo, em uma das reuniões, esboçamos nosso modo de ver, sem comtudo elaborar trabalho mais amplamente documentado. Agora vemos que Robson e Richards em seu bello livro varias vezes alludem

(pg. 105, 112, 127) á «tendencia ou capacidade inherente de uma especie para a variação» ou «nem todos animaes são igualmente susceptiveis de receber o influxo do ambiente nem estão no mesmo estado de actividade mutacional».

Para chegar a conclusões precisas, torna-se necessario formar a lista das especies estaveis, que, á semelhança da *Musca domestica* se mantem inalteradas, qualquer que seja o ambiente. A *trahira (Macrodon malabaricus)*, e o *mussum (Symbranchus marmoratus)* não apresentam variações, estejam elles nas lagunas da Argentina ou nos riachos da America Central, por isto nada tem de extraordinario sua estabilidade tambem no ambiente nordestino. A *seriema*, a *avestruz*, typos ancestraes, tambem não apresentam differenças subespecificas, ao se confrontar exemplares provindos dos limites extremos da vasta zona que habitam. Ao contrario daquellas, os *Dendrocolaptideos* e os *Formicarideos* entre as aves, e as *piabas*, ou sejam os *lambarys* sulinos *(Tetragonopterineos)*, e os *piáus* ou (piabas sulinas) além de apresentar grande variação especifica, tambem permittem o reconhecimento de subespecies, cujos limites de expansão condizem com subregiões zoogeographicas. No emtanto, no Nordeste, em nenhum desses grupos de grande plasticidade o systematista encontra facilidades para arrolar novas especies. Em ambos os casos estão actuando factores negativos para a differenciação de raças, formas e subespecies e, se o mesmo phenomeno se manifesta em qualquer ambiente, propicio ou não á variação das especies, é claro que a causa inhibidora é de origem endogena. O meticuloso confronto de material identico, colligido nas varias regiões, deverá comproval-o e é então que se faz mister a mais perfeita concordancia entre os diversos especialistas na apreciação dos caracteres especificos ou subespecificos.

Seja como for, as duas alternativas que acabamos de esboçar, não se excluem e é possivel que as duas hypotheses venham a ser confirmadas.

Os peixes d'agua doce do Nordeste constituem excellente material para taes pesquizas, pois que ha varias pequenas bacias hydrographicas isoladas, cujas populações por isto mesmo tambem permanecem isoladas. Os *Diaptomus*, como vimos acima, poderiam fornecer optima documentação, se não fosse o receio de se dever attribuir maior valor á facilidade que apresentam estas formas para sua rapida e larga disseminação. De accôrdo com esse e outros criterios a mesma inquirição deverá ser feita, tomando por base toda a serie de grupos de toda a serie zoologica.

A' pg. 135 do seu livro, Robson e Richards oppõem exemplos em contrario á demasiada generalização do principio do isolamento geographico como factor determinante da evolução. Além de varios exemplos da falta de endemismos, constatados em pequenas ilhas, á mesma pagina é citada a immensa area das florestas ininterruptas da Amazonia, que no emtanto deu origem a um enorme numero de especies, verdadeiros endemismos.

Por nossa parte queremos argumentar, citando o Nordeste arido do Brasil, que tambem representa uma vasta zona homogenea e que offerece condições de ambiente extremamente accentuadas; aqui, no emtanto, são raros os endemismos. O isolamento de certos grupos, principalmente dos peixes d'agua doce, é quasi sempre completo, em se tratando das pequenas bacias hydrographicas. Com relação a varios grupos (Lepidopteros, Reptis, Hirudineos, cf. Bibl.), já foram publicadas as listas das especies colligidas pela C. T. P.; para outros grupos (Aves, Molluscos, Espongiarios), estão ellas em elaboração, sem que

os respectivos especialistas tenham assignalado maior numero de especies novas, provenientes desta zona até agora ainda tão mal estudada. Predominam aqui as especies de ampla distribuição pela região neotropica ou um grande numero dellas é commum a quasi toda a região arida, situada entre 3.º e 13.º S. e 33.º a 44.º L. W., ou seja, 670.000 Klms.[2] — maior portanto que toda a Hespanha. Não será de extranhar que na contagem final de todas as especies nordestinas, venham a formar alta porcentagem aquellas que tem vasta distribuição por toda a região neotropica.

Faz-se mister organizar as listas faunisticas como a que elaborou H. von Ihering em seu trabalho de zoogeographia ornithologica, pondo em evidencia as formas de larga distribuição e as que só se extendem a areas menores.

SUMMARIO

— Não obstante outros ambientes scientificos mais adiantados considerarem menos actuaes os trabalhos de systematica, no Brasil necessitamos grandemente de uma intensificação dos trabalhos da catalogação de nossa fauna.

— Emquanto não for possivel prover pelo menos uma bibliotheca com o apparelhamento necessario para a classificação de toda a serie animal do Brasil e emquanto forem em numero tão reduzido os profissionaes encarregados do estudo de nossa fauna, devemos intensificar o intercambio com museus extrangeiros, para progredir na catalogação da fauna. Não ha nisto qualquer desdouro, equivalendo tal divisão de trabalho a uma economia bem comprehendida, desde que os biologistas nacionaes se empenhem em outros estudos, entre os quaem sobrelevam de importancia as questões ecologicas.

— Tanto para a rectificação de muitas questões dubias da classificação, como para a solução de outros problemas, é necessario reunir series amplas, que documentem a variabilidade e a disseminação das especies.

— O Nordeste proporciona interessantes possibilidades para a solução de questões zoogeographicas, bem como para conclusões de caracter mais geral, entre as quaes destacamos as seguintes proposições:

a) O Nordeste não é um ambiente favoravel para a formação de endemismos;

b) é preciso distinguir especies *estaveis* de especies *plasticas*.

c) Serão estas e não aquellas as mais uteis para a verificação da influencia ou não dos factores exogeneos sobre a formação de novas especies.

— Tambem este problema depende da catalogação minuciosa da nossa fauna.

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Studies on the ectoparasitic trematodes

Nobutaro Ishii and Toshisada Sawada
Parasitological Laboratory of the Government Institute for Infectious Diseases, Tokyo Imperial University – Japan.

[With 2 plates]

On the course of collecting the ectoparasitic trematodes for several years, we obtained fifteen species which belong to four Families mentioned below.

Family GYRODACTYLIDAE

Dactylogyrus inversus Goto & Kikuchi, 1917.
Tetrancistrum sigani Goto & Kikuchi, 1917.

Family TRISTOMATIDAE

Tristoma niagronum Ishii, 1936.
Tristoma katsuwonum Ishii, 1936.
Epibdella pagrosomi n. sp.

Family OCTOCOTYLIDAE

Hexacotyla grossa Goto, 1894.
Dactylocotyla thunni Ishii, 1936.

Family MICROCOTYLIDAE

Axine seriola Ishii, 1936.
Pseudaxine katsuwonis Ishii, 1936.
Pseudaxine vagans Ishii, 1936.
Gastrocotyla japonica n. sp.
Microcotyla toba n. sp.
Microcotyla aigoi n. sp.
Microcotyla mouwoi n. sp.
Gotocotyla sawara Ishii, 1936.

Dactylogyrus inversus Goto & Kikuchi, 1917.

Goto & Kikuchi found this worm from the gill of *Lateolabrax japonicus* (Japanese name Suzuki) but we obtained this from the gill of *Scomber japonicus* (Jap. name Saba).

Our measurements of this worm are as follows:

Body	2.14 — 3.98 × 0.33 — 0.588 mm.
Posterior hooks	
Central hooks	23 — 28 mikrons.

Bar (which connects the central hooks) 23 — 28 mikrons.
(not following the curve).

Marginal hooks 47 — 70 mikron.

Pharynx	0.105 — 0.14 × 0.105 — 0.168 mm.
Ovary	0.16 × 0.12 mm.
Testis	0.283 × 0.2 mm.
Penis	0.083 mm.

Tetrancistrum sigani Goto & Kikuchi, 1917.

Goto & Kikuchi obtained this worm from the gill of *Siganus fuscescens* (Jap. name Aigo), but we obtained from the gill of *Siganus fuscescens* and *Epinephetus chlorostigna* (Jap. name Mouwo).

The measurements of our specimens are as follows:

Body length	1.617 — 2.163 mm.
Body breadth	0.567 — 0.609 mm.
Pharynx length	0.0752 — 0.0846 mm.
Pharynx breadth	0.0752 — 0.0846 mm.
Testis length	0.315 — 0.399 mm.
Testis breadth	0.252 — 0.319 mm.
Ovary length	0.188 — 0.315 mm.
Ovary breadth	0.164 — 0.315 mm.
Hook length	0.079 — 0.094 mm.
Bar	20 mikron.

Tristoma magronum Ishii, 1936.

This specimen was obtained from the gill of *Thunnus orientalis* (Jap. name Magro).

External Characteristics: — The nearly ellipsoidal body is about 7 mm in length and 5.5 mm. in maximum breadth. Two oval anterior suckers, 0.912-0.996 mm. broad, are on either side of the anterior end of the body. A circular posterior sucker, which is much larger than the anterior suckers, lies at the middle of the posterior end of the body and measures about 1.577-1.776 mm in diameter. The posterior sucker is divided into a central and seven peripheral areas by week septa. A pair of hooks about 0.29 mm. in length and 0.05-0.058 mm. in maximum breadth, lie behind the central area.

Digestive Organs: — The mouth opens into the anterior end of the pharynx,

which lies posterior central part of the anterior suckers. The cup-shaped pharynx, anteriorly broad and posteriorly narrow, is about 1.26 mm. broad at the anterior widest part and 1.328 mm. long. The pharynx is followed by two intestines, which proceed along the outside of the testicular follicles with many side branches into the vitellaria to near the posterior end of the body.

Female Organs: — The egg-shaped ovary lies behind the pharynx and measures about 0.531 mm. in length and 0.764 mm. in breadth. The oviduct from the ovary runs forward to the genital pore, receiving the ducts from seminal receptacle and vitelline reservoir. The duct from the seminal receptacle opens into the vaginal opening, which lies behind the genital pore. The vitelline follicles fill up most of the lateral parts of the body from the level of the hind margin of the anterior suckers to the posterior end of the body.

Male Organs: — A numerous globular testicular follicles, 0.099-0.183 mm. in diameter, occupies the center part of the body. The vas deferens from the testes runs along the left margin of the ovary and then horizontally to the right and abruptly turns back to the left at a little anterior right part of the ovary. The portion where it turns being swollen like a sack, runs winding to a tube-like swollen portion, then to the genital pore. The genital pore opens behind the left anterior sucker.

Tristoma katsuwonum Ishii, 1936.

This worm was found from the gill of *Katsawomas vagans* (Jap. name Katsuwo).

External Characteristics: — The oval worm, about 3.9 mm. in length and 1.99 mm. in maximum breadth, is anteriorly little narrow and posteriorly broad. Two weak anterior suckers, 0.232-0.219 mm. in diameter, lie on either side of the anterior end of the body. One posterior sucker, about 0.365 mm. long and 0.531 mm. broad, is attached by a stalk-shaped protrusion of the posterior body. The posterior sucker is divided into a central and seven peripheral areas by the week chitinous septa. A pair of hooks, pointed at its slender end, lies in the middle part of the posterior sucker, and measures 0.116-0.133 mm. in length and 0.017-0.019 mm. in maximum breadth.

Digestive Organs: — The mouth opens into the pharynx, which is situated at the posterior central part of the anterior suckers. The funnel-shaped pharynx, anteriorly broad and posteriorly narrow, is about 0.581 mm. in diameter. The pharynx is followed by two intestines, which run along the outside of the testes with numerous side branches into the vitellaria.

Male Organs: — About 40 small globular testes, 0.116-0.133 mm. in diameter, lie in the middle of the body. The vas deferens from the testes runs along the left margin of the ovary and then horizontally to the right and abruptly turns parallel back to the left part of the ovary. The portion where it turns forms a sack. At the left of the ovary it turns forward and proceeds into the genital pore, which lies near the left margin of the body at about the middle of the pharynx.

Female Organs: — The ellipsoidal ovary, about 0.266 mm. long and 0.315 mm. broad, lies in front of the testes. The oviduct from the ovary opens into the genital pore, receiving the ducts from vitelline reservoir and seminal

receptacle. The oval seminal receptacle. 0.166 mm. in length and 0.141 mm. in breadth, lies at the left anterior part of the ovary. The duct from the seminal receptacle runs forward to the vaginal opening, which is situated just behind the genital pore. The vitelline reservoir lies in front of the ovary. The vitelline follicles fill up the lateral part of the body from the level of the anterior margin of the pharynx to the posterior part of the testes.

Epibdella pagrosomi n. sp.

This worm was obtained from the gill of *Pagrosomus major* (Jap. name Madai).

External Characteristics: — The ellipsoidal body is 2.0-5.6 mm. long and 1.26-2.66 mm. broad. The oval anterior suckers. 0.21-0.996 mm. in length and 0.21-0.82 mm. in breadth. lie at the anterior end of the body. One circular posterior sucker, 0.7-1.89 mm. in diameter, is attached ventrally to the posterior end of the body and provided with a thin marginal fringe about 0.066 mm. broad. Three pairs of hooks lie behind the central area of the posterior sucker; the anterior hooks. 0.066-0.115 mm. by 0.028-0.0329 mm., are pointed anteriorly, the middle and the posterior hooks are elongated. slender and somewhat sinuous, with a short strongly recurved sharp point, the former measures about 0.118 mm. long (not following the curve and the latter about 0.047 mm. long.

Digestive Organs: — The mouth lies at the distance of 0.235-0.63 mm. from the anterior end of the body. The large glandular pharynx, 0.21-0.42 mm. in diameter being consisted of many muscular rodlets. is followed by a short oesophagus. Two intestinal trunks from the oesophagus run posteriorly with numerous side branches into the vitellaria and these branches of both sides unite with each other at the post-testicular field. The nervous system consists of a large crescentic mass in front of the mouth and two pairs of eye-spots are seen at the antero-dorsal side of it.

Male Organs: — Two nearly circular testes, 0.235-0.63 mm. long by 0.188-0.48 mm. broad, lie side by side at about the middle of the body. Vasa efferentia from the inner surface of the testes unite with each other behind the ovary to form vas deferens, which proceeds forward between the vitelline reservoir and the left testis into a swollen portion with complicated convolutions and finally enters the penis at its base. The large elongated prostate gland lies just behind the penis. The genital pore opens on the left lateral margin of the body just behind the anterior sucker.

Female Organs: — The ellipsoidal ovary, 0.168-0.315 mm. by 0.103-0.231 mm., lies in a little anterior part between the testes. The oviduct from the ovary runs forward, receiving the yolk-duct and becomes the ootype, around which shell gland cells present. The uterus runs forward to the left and opens into the genital aperture. The vitelline follicles fill up almost the lateral and post-testicular part. from the level of the mouth to the posterior end of the body. Two yolk-ducts from the union of the ducts coming respectively from the anterior and posterior vitelline follicles, proceed to the median line, and form a globular yolk-reservoir, measuring 0,094-0.235 mm. by 0.066-0.108 mm. A short duct from the yolk-reservoir leads into the oviduct. The vaginal opening lies in contact behind the genital opening. The pyramid-shaped eggs

have a thick yellow coloured shell and four rounded angles. A long curled filament attaches to a point near one of four angles. The distance of two angles measures about 0.112 mm.

Discussion: — This worm resembles *Epibdella ishikawae* Goto, 1894, but differs essentially in the character of the posterior hooks and in the presence of the oesophagus and the vitelline reservoir.

Hexacotyla grossa Goto, 1894.

Goto obtained this worm from the gill of *Parathunnus sibi* (Jap. name Mebachimaguro), but we obtained from the gill of *Seriola quinqueradiata* (Jap. name Buri), *Katsuwonus vagans* (Jap. name Katsuwo), *Thunnus orientalis* (Jap. name Maguro).

The measurements about this worm are as follows:

Body length	14.69	—	18.6	mm.
Body breadth	3.5	—	4.2	mm.
Oesophagus	3.8	—	4.0	mm.
Anterior sucker	0.028	×	0.066	mm.
Pharynx	0.12	×	0.048	mm.
Genital opening	0.217	×	0.183	mm.
Vaginal opening	0.217	×	0.25	mm.
Posterior sucker				
outer pair	0.551	×	0.45	mm.
inner pair	0.14	×	0.2	mm.
Posterior hook				
outer pair	0.068	—	0.1	mm.
inner pair	0.024	—	0.036	mm.
Egg	0.116	×	0.25	mm.
with a filament measuring	0.25	—	0.334	mm., on both ends.

Dactylocotyla thunni Ishii, 1936 *.

This worm was found on the gill of *Thunnus orientalis* (Jap. name Maguro).

External Characteristics: — The body is minute elongated more or less pointed anteriorly and measures about 1.15-1.18 mm. in length and 0.19-0.52 mm. in maximum breadth. A pair of ellipsoidal anterior suckers, 0.072-0.075 mm. long by 0.033-0.042 mm. broad, are on either side of the anterior end of the body. The cotylophore is connected to the body by a handle of oblong shape, while the posterior part of it is diamond-shaped. Four frame-worked suckers, about 0.058-0.066 mm. in diameter, are situated on both sides of the cotylophore projected by a short stalk. Two pairs of hooks are at the posterior end of the cotylophore; the larger outer pair measures 0.116-0.125 mm. in length, and the smaller inner pair 0.02-0.024 mm. in length.

Digestive Organs: — The mouth, which lies at the anterior end of the body, is followed by a round pharynx, 0.042-0.049 mm. in diameter, in con-

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* Ishii described this worm as *Dactylocotyla minor* in the Zoological Magazine Vol 48, Nos. 8,9,10, but corrected it to *D. thunni*.

tact with two anterior suckers. The oesophagus, about 0.216 mm. long, bifurcates into two intestinal canals, which run about three-fourths the length of the body, famifying its branches into the vitellaria and ending blindly.

Female Organs: — The horse-shoe-shaped ovary, measuring 0.38 mm. in length, lies at about the centre of the body. The oviduct from the ovary receives the ducts from the seminal receptacle and the genito-intestinal canal and becomes the ootype. Soon after leaving the ootype the oviduct turns forward and becomes the uterus, which opens into the genital pore. The eggs in the uterus, 0.092 mm. in length and 0.032 mm. in breadth, have a filament on both ends. The vitelline follicles fill up the lateral parts of the body from the level of the posterior part of the genital opening to near the cotylophore. Two vitelline ducts from both sides unite and empty into the oviduct.

Male Organs: — About ten small testicular follicles lie behind the ovary. The vas deferens proceeds forward to the genital pore. The genital pore, about 0.049 mm. in diameter, lies at the bifurcating portion of the intestinal canal surrounded by ten spines.

Axine seriola Ishii, 1936.

This fluke was found from the gill of *Seriola quinqueradiata* (Jap. name Buri).

External Characteristics: — The body, 15-20 mm. in length, is spatulate-shaped, anteriorly blunt, posteriorly broad, and the half posterior portion is approximately of the same breadth of 2 mm. Two oval anterior suckers lie at the anterior end of the body, measuring 0.216-0.249 mm. in length and 0.149-0.174 mm. in breadth. The cotylophore is asymmetrical and extending like a fan at the posterior end of the body, with 33-37 suckers in a line on its margin. The posterior sucker divide into two parts; one part has 23-28 large suckers, 0.498-0.587 mm. in breadth, and the other has 9-10 small suckers. Each sucker has a chitinous framework.

Digestive Organs: — The mouth at the anterior end of the body leads into the small oval pharynx, measuring 0.099 mm. in length and 0.066-0.075 mm. in breadth. The oesophagus, 0.913-1.046 mm. long, bifurcates into two intestinal canals which run along the inside of the vitellaria, with many ramifying branches into the vitellaria, and end at the right part of the cotylophore.

Male Organs: — Many globular testicular follicles lie in the middle of the posterior part of the body. The vas deferens from the testes runs forward into the genital aperture, which lies near the bifurcating point of the intestines.

Female Organs: — The elongated and horse-shoe-shaped ovary, 2.49-2.82 mm. long, lies at the anterior part of the testes. The oviduct from the posterior end of the ovary runs backward and becomes the ootype, connecting the canals from the seminal receptacle, vitelline reservoir and genito-intestinal canal. Around the ootype is a mass of shell gland cells. The uterus with numerous eggs runs forward to the genital aperture. The oval seminal receptacle measures 0.332-0.365 mm. in length and 0.249 mm. in breadth. The yellow brown eggs, 0.149-0.166 mm. in length and 0.083-0.099 mm. in breadth, have a filament on one end and a cover on the other. The vitellaria fill up the lateral body from the level of the posterior part of the vaginal opening to the middle

of the caudal disc. Paired yolk-duct from both vitellaria unite and pass posteriorly above the ovary. Two ducts from the anterior vitellaria unite and run into the vaginal opening. The circular vaginal opening lies 0.713-0.879 mm. behind the genital opening at the middle of the anterior end of the vitellaria.

Pseudaxine katsuwonis Ishii, 1936.

This worm was found from the gill of *Katsuwonus vagans* (Jap. name Katsuwo).

External Characteristics: — The leaf-shaped body, about 8 mm. long by 3 mm. broad, is anteriorly narrow and posteriorly broad. The mouth opens at the anterior end of the body in which lie paired egg-shaped anterior suckers, 0.075 mm. long by 0.058-0.066 mm. broad. The neck is sharply divided from the body, and also the fan-shaped cotylophore by a notch, which is inclining and the posterior part of it occupies the lateral part of the body. About twenty-four chitinous frameworked suckers, about 0.199 mm. in maximum breadth, are arranged in a row on the margin of the cotylophore. At the left pointed extreme of the cotylophore, namely, the posterior end of the body, is a spatulate-shaped protrusion on which lie two pairs of hooks, the outer larger one measures about 0.048 mm. and the smaller about 0.028 mm. long.

Digestive Organs: — The terminal mouth leads into the oval pharynx, which lies between the anterior suckers and measures about 0.091 mm. in length and 0.049 mm. in breadth. The oesophagus, about 0.35 mm. long, bifurcates into two intestinal canals, running along the inside of the vitellaria, with many ramifying branches to the left part of the cotylophore.

Female Organs: — The horse-shoe-shaped ovary, about 2.98 mm. long, lies at about the left centre of the body. The oviduct from it becomes the ootype, receiving the genito-intestinal canal and the yolk-duct. Around the ootype the shell gland cells are present. The uterus runs forward into the genital aperture, which lies near the bifurcating point of the intestines. The eggs, 0.216 mm .long by 0.066 mm. broad, with a filament on both ends are seen in the uterus. The vitellaria fill up the lateral body, outside the intestinal trunks from the neck to the cotylophore. Two yolk-ducts from both sides at the level of the middle of the ovary unite and run backward into the oviduct. The anterior yolk-ducts, from the anterior end of the vitellaria, unite once and divide into two vaginal openings, situated on the lateral margins of the neck.

Male Organs: — Many testicular follicles occupy the inner field of the intestinal trunks from the neck to the posterior part of the body proper. The vas deferens from the posterior part of the testes, runs forward to the genital openings which has twelve spines.

Pseudaxine vagans Ishii, 1936.

This worm is also found on the gill of *Katsuwonus vagans* but it is quite different from *Pseudaxine katsuwonis*.

External Characteristics: — The body, about 6.0 mm. in length and 1.5 mm. in maximum breadth, is anteriorly narrow and posteriorly broad. The mouth opens at the anterior end of the body, and on both sides of it is a

pair of oval anterior suckers, measuring 0.012-0.019 mm. long by 0.033-0.042 mm. broad. On the posterior part of the body a clear notch is seen between the body and the cotylophore, which is like a fan and inclining to the body, and 13-15 posterior suckers in a row on its margin. The posterior sucker has a chitinous framework and measures about 0.216 mm. in breadth. The left extreme of the cotylophore forms a small spatulate protrusion, on which two pairs of hooks are present, the larger 0.045-0.046 mm. and the smaller 0.025-0.026 mm. long.

Digestive Organs: — The oval pharynx, about 0.075 mm. in length and 0.033 mm. in breadth, lies just behind the two anterior suckers. The oesophagus, about 0.166 mm. long, bifurcates into two intestinal canals. The intestines run, with many anastomosing branches into the vitellaria, to near the posterior end of the cotylophore.

Female Organs: — The horse-shoe-shaped ovary, about 1.079 mm. in length, lies in the middle of the body. The oviduct from the ovary receives the genito-intestinal canal and the yolk-duct and becomes the ootype, around which shell gland cells are present. The uterus, following to the ootype, runs forward to the genital opening, which lies at about the middle of the oesophagus. Few eggs, 0.166 mm. long and 0.075 mm. broad, in the uterus, has a filament on both ends. The vitellaria lie on both sides of the body, from the level of the bifurcating point of the intestine to the middle part of the cotylophore. Two yolk-ducts from both vitellaria unite behind the ovary, and run posteriorly into the oviduct. Two anterior yolk-ducts unite at the posterior part of the genital pore and again dividing into two; each of them opens into the vaginal openings, which lie at the lateral margins of the neck.

Male Organs: — The small and numerous testes, lie behind the ovary. The vas deferens from the testes runs forward into the genital opening.

Gastrocotyla japonica n. sp.

This worm was found on the gill of *Scomber japonicus* (Jap. name Saba).

External Characteristics: — Body asymmetrical, being about 1.74 mm. in length and 0.42 mm. in maximum breadth. Two anterior suckers, about 0.024 mm. long and 0.018 mm. broad, lie at the anterior end of the body. The anterior one-third of the body is narrow and the posterior two-thirds is broad and spreading to the right, on which margin 16-20 frameworked suckers, about 0.075 by 0.056 mm. in size, are lined longitudinally. A small muscular protrusion 0.065-0.084 mm. by 0.047 mm. in size, lies at the posterior end of the body. Two pairs of hooks are on the protrusion, the outer hooks are strong with a recurved sharp point and 0.051-0.056 mm. long, the inner are about 0.024 mm. long also with a recurved point.

Digestive Organs: — The mouth, which opens at the anterior end of the body, is followed by a small pharynx. The short oesophagus divides into two intestines which run to near the posterior end of the body and unite behind the testes.

Male Organs: — The numerous small testicular follicles lie in the posterior portion of the body. The vas deferens runs forward and opens into the genital

pore, which lies aboul 0.11 mm. in distance from the anterior end and surrounded by twelve conical spines, being 5 mikron long.

Female Organs: — The longitudinally elongated ovary lies in front of the testes at the right of the middle of the body. The oviduct from the posterior end of the ovary runs forward to the genital pore, connecting the yolk-duct at the beginning of its course. The vitellaria extend from the level of the genital pore to the posterior end of the body and surround the intercecal field. Two yolk-ducts from both vitellaria unite at about the posterior end of the ovary, and divide into two; the one empties into the oviduct, and the other, swollen and filled with yolk cells, proceeds forward on the median line into the vaginal opening, which lies near the bifurcating portion of the intestine.

Discussion: — The worm differs from *Gastrocotyla trachuri* in the number of the posterior sucker, posterior hook and measurements. *G. trachuri* has 32-38 suckers with four hooks and three pairs of hooks at the posterior end of the body.

Microcotyla toba n. sp.

Some specimens were found from the gill of *Siganus fuscescens* (Jap. name Aigo).

External Characteristics: — The symmetrical, spindel-shaped body measures 2.2-2.5 mm. long and 0.27-0.35 mm. broad. The body proper is very broad, nearly rounded. Two oval anterior suckers, 0.075 mm. long by 0.038-0.075 mm. broad, lie at the anterior end of the body. The cotylophore, about two-fifths the length of the body, is very narrow, and the sucker bearing portion projecting slightly in front of the ventral side, on which 23 pairs of chitinous frameworked suckers, 0.07-0.1 mm. in breadth, lying in two rows.

Digestive Organs: — The mouth, which opens at the anterior end of the body, is followed by a small oval pharynx, about 0.079 mm. in length and 0.199 mm. in breadth. The oesophagus is very short and divides into two intestines, which run backward with many side branches into the vitellaria to near the posterior end of the body proper.

Male Organs: 25-30 testes, about 0.1 mm. by 0.03 mm., lie in the intercecal field from hind part of the ovary to near the posterior end of the body proper. The vas deferens from the testes runs forward on the median line, into the genital pore, which lies near the bifurcating point of the intestine. The genital opening, 0.99 by 0.63 mm. large, has numerous (about 200) conical pointed, slightly recurved spines, being about 10-14 mikrons in length.

Female Organs: — The compressed S-shaped ovary, about 0.95 mm. long, lies in front of the testes with its distal end on the right. The oviduct from the posterior right end of the ovary, runs to the left, receiving the yolk-duct and the genito-intestinal canal, and turns forward to become the ootype, around which shell gland cells present. The uterus proceeds on the median line to the genital aperture. The vitellaria extend from the posterior margin of the genital pore to the posterior end of the body proper, covering almost the whole length of the intestines. The yolk-ducts from both vitellaria, run inward and divide into two pairs of ducts which proceed anteriorly and posteriorly. The anterior pair unites on the median and becomes the vaginal canal, which opens dorsally on the median line at the distance of 0.43-0.6 mm. from the

anterior extremity. The posterior pair unites and enters into the oviduct near the ootype.

Discussion: — This species resembles *M. hiatulae* Goto, but differs chiefly in the number of testes, and in the shape of the ovary, intestine and the measurement.

Microcotyla aigoi n. sp.

This worm was obtained from the gill of *Siganus fuscescens* (Jap. name Aigo).

External Characteristics: — The symmetrical, elongated, leaf-shaped body measures 2.1-3.78 mm. long and 0.441-0.84 mm. broad. Two oval anterior suckers, about 0.07 mm. in length and 0.047 mm. in breadth, lies side by side at the anterior blunt end of the body. The caudal disc, one-third the length of the body has 42-45 pairs of suckers in two rows. The posterior suckers, about 0.07 mm. in length and 0.047 mm. in breadth have a chitinous framework. The sucker bearing portion is protruding a little ventrally.

Digestive Organs: — The terminal mouth is followed by the pharynx which lies in contact with the anterior sucker and is about the same size of the oral sucker. The pharynx leads into the short oesophagus which divides into 2 intestinal canals. The intestinal canals run backwards with many branches into the vitellaria, the right one to near the end of the body proper, and the left one to the anterior part of the caudal disc.

Male Organs: — About thirty small testicular follicles lie in the interceeal field between the posterior margin of the ovary and the posterior end of the body proper. The vas deferens from the testes runs to the genital pore, which lies on the median and ventral at the bifurcating portion of the intestinal canals. The genital pore, 0.141-0.23 mm. broad and 0.094-0.168 mm, long, is armed with numerous (about 200) sharp broad based conical spines, measuring 9-14 mikrons in length.

Female Organs: — The J-shaped ovary lies in front of the testes. The oviduct from the right extreme of the ovary runs backward connecting the yolkduct, and at the middle front of the testes it turns forward to become the ootype, which lies at near the posterior part of the ovary. The well-developed shell gland cells surround the ootype. The ootype is followed by the uterus, which proceeds on the median line to the genital opening. The egg, 0.189-0.244 mm. long by 0.047-0.084 mm. broad, has two long filaments on both ends. The vitellaria fill up almost the lateral part of the body from the level of just behind the genital opening to near the posterior end of the body proper. Two yolk-ducts from the level of the middle of the body proceed backward and unite, and then connects with the oviduct. The anterior yolk-ducts run parallel to near the vaginal opening and open into the vagina.

Discussion: — This species differs from the *Microcotyla caudata* in the number of testes and posterior suckers, and the measurements.

Microcotyla mouwoi n. sp.

This worm was obtained from the gill of *Siganus fuscescens* and *Epinepherus chlorostigna* (Jap. name Aigo and Mouwo).

External Characteristics: — The elongated body measures 2.2-3.2 mm. long

and 0.378-0.55 mm. broad. Two oval anterior suckers, about 0.07 mm. in length and 0.05-0.056 mm. in breadth, lie at the anterior end of the body. The short caudal disc has 28-30 suckers, 0.047-0.061 mm. by 0.0235-0.028 mm., on each margin. Each sucker is provided with a chitinous framework.

Digestive Organs: — The mouth, which opens at the anterior end of the body, leads into the pharynx. The pharynx lies in contact with two anterior suckers and is a little smaller than the anterior suckers. The short oesophagus divides into two intestinal canals, which run to near the end of the caudal disc, with many side branches into the vitellaria.

Male Organs: — 15-17 oval testicular follicles, lie longitudinally on the median line at the posterior portion of the body with one-fourth the length of the body. The vas deferens from testes winds on forward along the ovary, into the genital opening, which lies at a distance of about 0.188 mm. from the anterior end of the body and has four long spines, measuring 18-33 mikron in length

Female Organs: — The elongated ovary, about 0.7 mm. long, lies at about the middle, with the slender end posteriorly and the broad anterior part to the right. The oviduct receives the yolk-duct and becomes the slender ootype. The uterus proceeds forward to the genital opening. The vitellaria fill up the lateral body from a little behind the genital opening to the end of the caudal disc. The vaginal opening lies median, dorsal and behind the genital opening.

Discussion: — This worm resembles the *Microcotyla elegans* Goto, but differs in the number of the testes and the posterior suckers and also in the character of the atrial spines and the vitellaria.

Gotocotyla sawara Ishii, 1936.

This worm was obtained from the gill of *Sawara niponica* (Jap. name Sawara).

External Characteristics: — A narrow elongated worm, 10-12 mm. long and 0.75-0.85 mm. broad, resembles to *Microcotyla* sp. The mouth opens at the anterior end of the body and on both sides of it, lies a pair of oval anterior suckers, measuring about 0.116 mm. in length and 0.05 mm. in breadth. A muscular sucker-like adhesive organ, about 0.266 mm. in diameter, is median and dorsal at about the neck. The swollen cotylophore is divided from the body proper by a notch and becomes narrower to the small posterior spatulate protrusion, on which a pair of hooks, measuring 0.249 mm. in length, present. About 140 frameworked suckers, 0.166 mm. long and 0.066 mm. broad, are on both sides of the cotylophore in two rows.

Digestive Organs: — In the funnel-shaped mouth cavity, which lies at the anterior end of the body, a pair of oval shaped anterior suckers, 0.066 mm. long and 0.049 mm. broad, present. The pharynx leads into the oesophagus, about 0.3 mm. long, which bifurcates into two intestines, running into the cotylophore with many branches into the vitellaria.

Female Organs: — A narrow long ovary lies at about the middle and left to the median line of the body, and is seen appearantly like two parallel threads with its recurving portion anteriorly. The oviduct from the ovary receives the canals; the first from the large oval seminal receptacle, measuring about 0.49 mm. in length and 0.22 mm. broad, the second the genito-intestinal canal, the

third yolk-duct and then becomes the ootype, around which shell gland cells present. In the uterus which runs sinuously to the genital pore, oval-shaped eggs, about 0.216 mm. long and 0.019 mm. broad and with a filament on both ends, are present. The vitelline follicles fill up the lateral part of the body from the level of the vagina to the anterior part of the cotylophore. At the middle and behind the ovary, two ducts from lateral vitellaria unite and open into the oviduct. Two ducts from anterior part of the vitellaria unite on the median and open into the vaginal opening, which is 0.04-0.06 mm. in diameter and in contact behind the cirrus sack.

Male Organs: — Numerous small testicular follicles occupy the central portion of the body, from the posterior margin of the ovary to the anterior part of the cotylophore. The vas deferens from the testes runs forward to the genital opening. The cirrus sack is about 0.664 mm. long by 0.166 mm. broad. The bar-shaped penis is 0.266 mm. long (when stretched) and surrounded with numerous spines.

Attraction: — In the diagnosis of genus *Microcotyta* is described that it has no hooks on the posterior end of the body. Ishii (1936) elected the genus *Gotocotyta* which has the hooks on the posterior end of the cotylophore.

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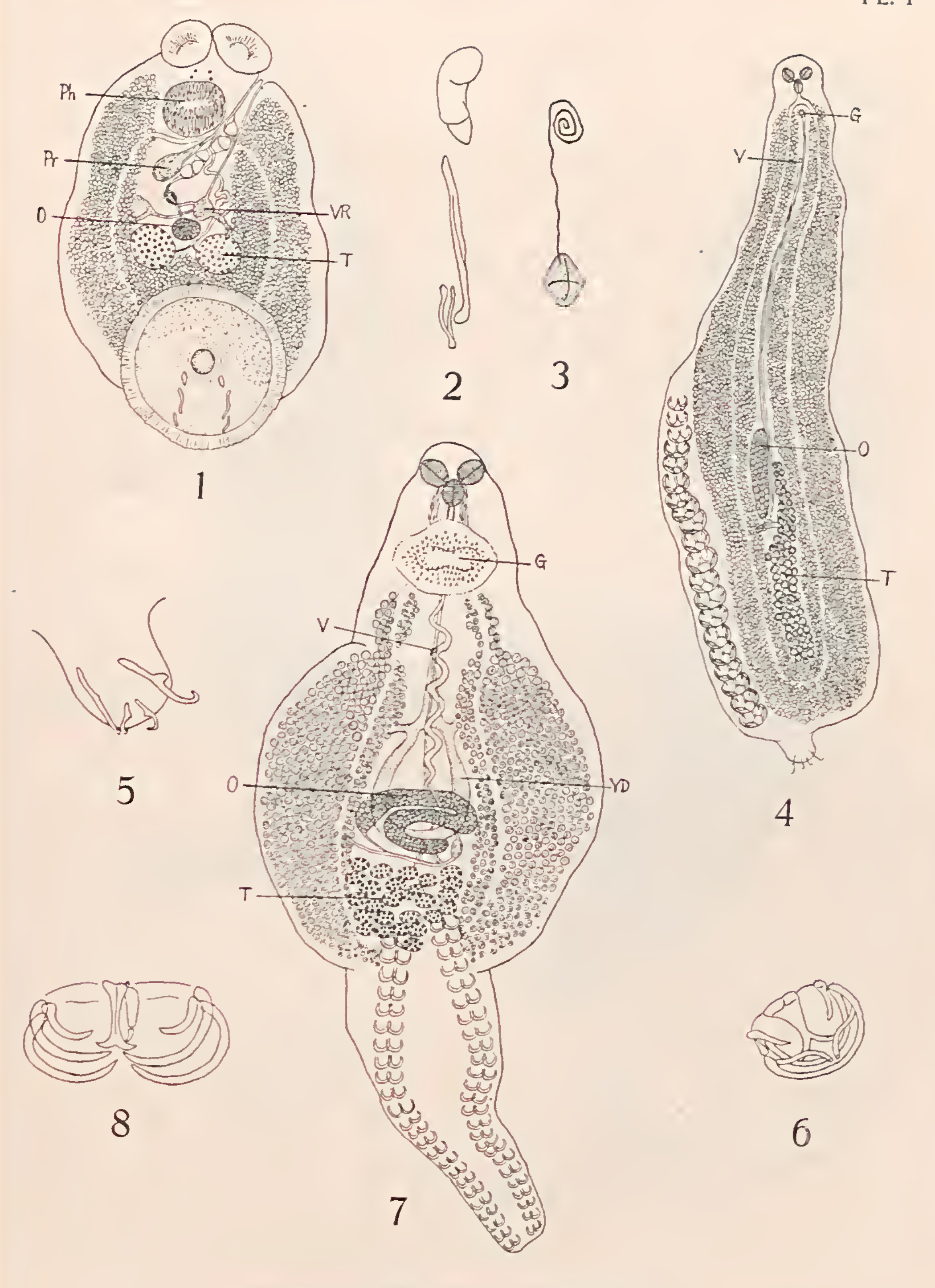
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Plate 1

Fig. 1 — *Epibdella pagrosomi* n. sp.
Fig. 2 — Posterior hooks of *E. pagrosomi.*
Fig. 3 — Egg of *E. pagrosomi.*
Fig. 4 — *Gastrocotyta japonica* n. sp.
Fig. 5 — Posterior hook of *G. japonica.*
Fig. 6 — Framework of posterior sucker of *G. japonica.*
Fig. 7 — *Microcotyla toba* n. sp.
Fig. 8 — Framework of posterior sucker of *M. toba.*

Abbreviations used in Figures. — G — genital opening, O — ovary, Ph — pharynx, Pr — prostate gland, T — testis, V — vaginal opening, VR — vitelline reservoir, YD — yolk duct.

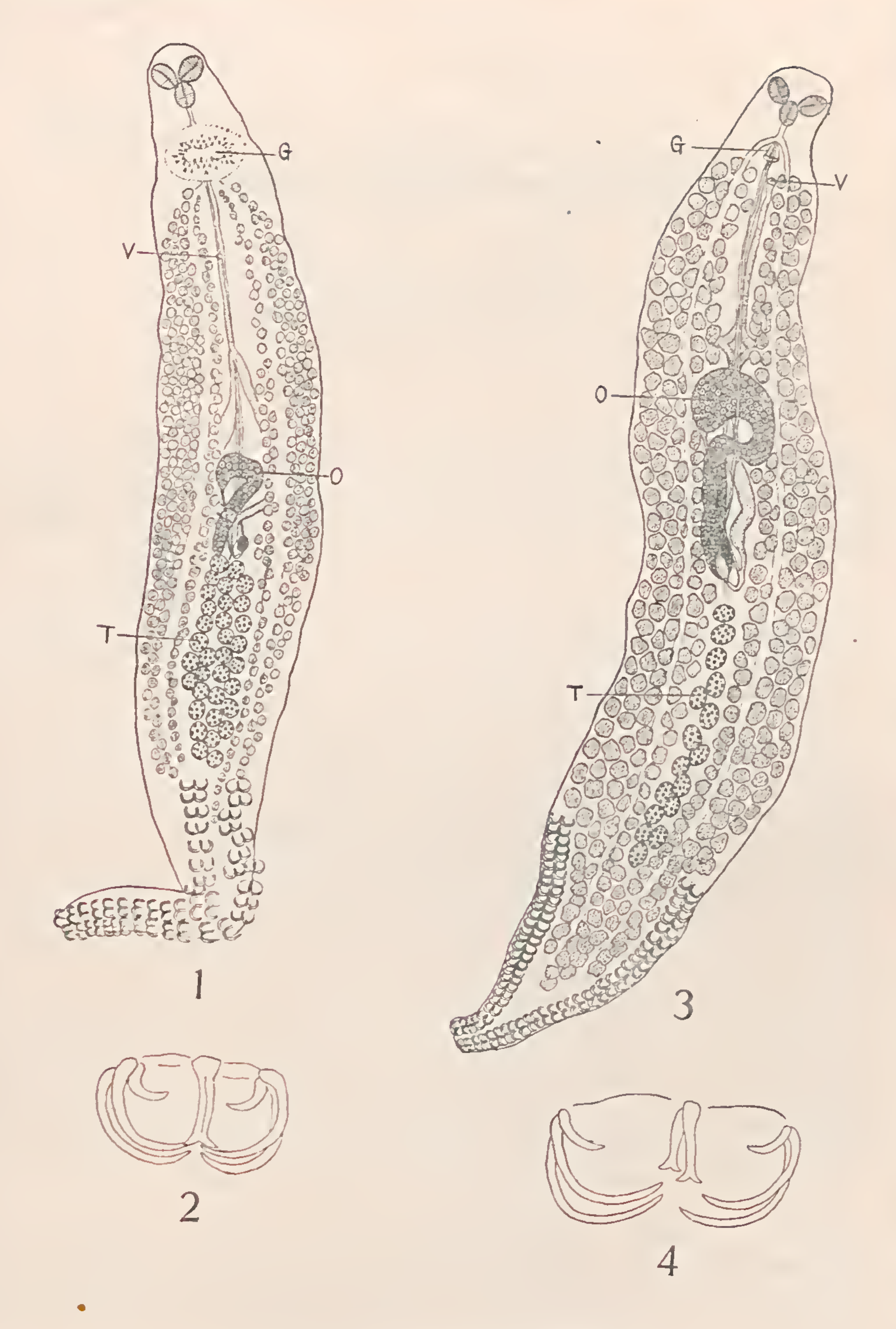


Ishii & Sawada : Ectoparasitic trematodes.

Plate 2

Fig. 1 — *Microcotyla aigoi* n. sp.
Fig. 2 — Framework of posterior sucker of *M. aigoi*.
Fig. 3 — *Microcotyla mouwoi* n. sp.
Fig. 4 — Framework of posterior sucker of *M. mouwoi*.

Abbreviations used in Figures. — G — genital opening, O — ovary, T — testis, V — vaginal opening.



Ishii & Sawada: Ectoparasitic trematodes.

Recherches sur le début du développement des Cestodes chez leur hôte définitif

Ch. Joyeux et **J.-G. Baer**
Institut de Médecine et de Pharmacie Coloniales, Marseille — France.
Institut de Zoologie, Neuchatel — Suisse.

[Avec 1 planche et 1 fig. texte]

Les larves monocéphales de Cestodes se présentent sous de multiples aspects morphologiques. On peut schématiquement les subdiviser en deux groupes: dans le premier, la larve proprement dite, c'est à dire le scolex et le début du futur Ver adulte, est nue; dans le second, elle est entourée d'un involucre, de structure plus ou moins compliquée, destiné à dégénérer en arrivant chez l'hôte définitif.

L'évolution de cette larve proprement dite, débarrassée de son involucre lorsqu'il existait, paraît aisée à concevoir: après fixation à la muqueuse intestinale, il lui suffit de s'allonger et de se segmenter pour donner le Ver adulte. C'est, en effet, ce qui semble se produire assez souvent; mais, dans un certain nombre de cas, les choses ne se passent pas d'une façon aussi simple.

Nous avons eu l'occasion de montrer (1931) que les plérocercoïdes de *Diphyllobothrium*, malgré leur apparence homogène, étaient en réalité composés de deux portions: l'une antérieure, à cuticule épaisse, à musculature développée, possédant de nombreux corpuscules calcaires dans son parenchyme; l'autre postérieure, ayant les caractères contraires. Lorsqu'on fait ingérer les plérocercoïdes de *D. erinacei europaei* (Rud.), provenant de la couleuvre *Tropidonotus natrix* var. *persa* Pall. à un Chat, on constate que la partie postérieure dégénère et disparaît; seule la partie antérieure, comprenant le scolex, persiste et se développe. Les plérocercoïdes mesurant environ 40 à 60 mm. avant l'ingestion, on trouve quatre jours après, à l'autopsie du Chat, de jeunes Vers ayant 5 à 15 mm. comme dimensions extrêmes, soit 7 à 8 en moyenne. Nous avons précisé ce mécanisme *in vitro*: en plaçant nos plérocercoïdes à 37°, dans du suc intestinal de Chien, additionné d'eau physiologique, nous avons observé, au bout d'un temps variant de quelques minutes à quelques heures, la scission du plérocercoïde et la disparition par digestion de la portion postérieure (fig. 1). Lorsque le plérocercoïde se réencapsule, ce mécanisme se produit également dans la plupart des cas; cependant parfois, la larve passe entièrement à travers la paroi du tube digestif, ainsi que nous l'avons déjà fait remarquer (1931).

Dans un groupe de Cestodes voisins, la Ligule, *Ligula intestinalis* (L.) se comporte tout autrement. Le plérocercoïde, vivant chez divers Poissons d'eau douce, possède déjà des organes génitaux ébauchés. On sait qu'il devient adulte en quelques jours dans l'intestin d'un grand nombre d'Oiseaux aquatiques. En

le faisant ingérer par des Canards, qui sont ensuite sacrifiés en série, on ne constate aucune scission analogue à celle des *Diphyllobothrium*, le Ver entier se développe. On peut aussi réaliser cette maturation *in vitro*. En cultivant les plérocercoïdes de *L. intestinalis* provenant de Tanches: *Tinca vulgaris* Cuv., dans des boîtes de Roux, contenant de l'eau physiologique additionnée d'un quart de sérum ou de liquide d'ascite, et portées à 38-42°, on obtient un développement souvent plus lent que chez l'hôte normal, durant de 6 à 13 jours. Pendant ce temps, les Vers sont bien vivants, doués de mouvements. Vers le quatrième jour, on observe dans l'utérus de nombreux oeufs, qui bientôt prennent une teinte foncée, leurs amas formant des taches noires au centre des masses génitales. Ils sont expulsés en général à partir du huitième jour et se répandent dans le liquide, où on les retrouve par décantation. Les Vers meurent ensuite. Toutefois ces oeufs ne se développent pas; l'étude histologique des plérocercoïdes ainsi cultivés fait voir que l'ovogenèse seule s'est effectuée, la spermatogenèse ne s'est pas accomplie normalement. Les testicules ne montrent que de rares spermatozoïdes, les conduits génitaux mâles n'en contiennent pas, alors qu'ils en sont bourrés chez les Ligules témoins évoluant dans l'intestin du Canard. Donc, dans ce cas, le développement du Ver s'est accompli sans aucune scission. Peut-être avait-elle eu lieu précédemment, au moment où le plérocercoïde ébauche ses organes génitaux chez le Poisson: nous n'avons pu encore éclaircir ce fait.

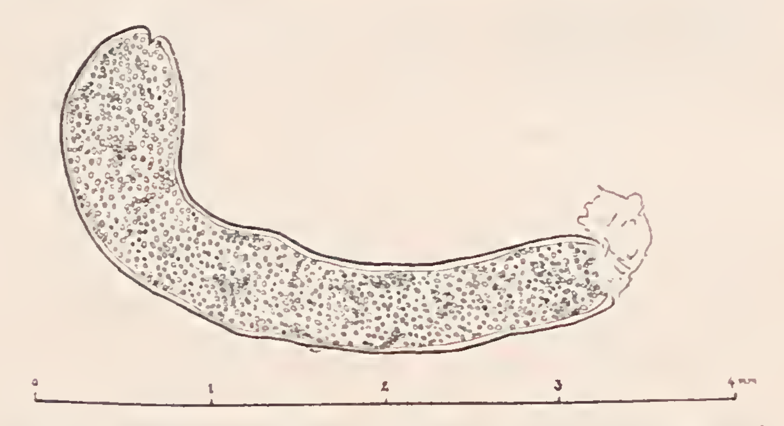


Fig. 1 — Partie antérieure du plérocercoïde de *Diphyllobothrium erinacei europaei* (Rud.) séparée, dans le suc intestinal, de la partie postérieure, dont il reste encore un fragment en dégénérescence.

Dans un groupe de Cestodes éloigné des précédents, se trouve *Cysticercus fasciolaris* (Rud.), vivant dans le foie de divers Rongeurs, notamment des Rats, dont l'adulte est le *Taenia taeniaeformis* Batsch, de l'intestin du Chat et autres Carnivores. La larve proprement dite, dégagée de son kyste, est ici représentée par un Ver déjà développé, de longueur très variable suivant les échantillons, comprenant le scolex, le cou, un nombre variable d'anneaux et la vésicule. Ce nombre d'anneaux est difficile à compter sur une larve contractée. Dans nos échantillons en bonne extension, nous trouvons jusqu'à présent un chiffre supérieur à 200, pouvant dépasser 400. Leuckart avait déjà

vu qu'une scission s'opère lorsque ce cysticerque est absorbé par le Chat. D'après cet auteur, tous les anneaux sont détruits, seul le scolex persiste et une nouvelle chaîne se forme:

„Durch die von mir angestellten Fütterungsversuche ist übrigens der Beweis geliefert, dass diese Glieder nach der Einwanderung in den Darm der Katze zu Grunde gehen und durch eine persistirenden Kopfe neu sich anbildende Kette ersetzt werden". (1878, p. 605, note 2).

A l'examen direct de ces larves, fixées en bonne extension, on constate que la partie antérieure est plus épaisse et plus robuste que la postérieure. La numération des corpuscules calcaires montre qu'ils sont plus nombreux dans la partie antérieure. Nous faisons cette opération par la technique que nous avons préconisée pour les plérocercoïdes de *Diphyllobothrium*: en comptant les corpuscules du parenchyme compris dans plusieurs rectangles formés par les divisions de l'oculaire micromètre et en calculant ensuite la moyenne. Nous trouvons 80 à 100 dans la région du scolex et 60 vers l'autre extrémité. Avec les plérocercoïdes de *Diphyllobothrium* la différence était plus accusée. Nous obtenions 80 à plus de 100 pour l'extrémité antérieure et 1,7 à 12,4 pour la postérieure.

Le système musculaire nous a fourni de bons caractères pour distinguer les portions antérieure et postérieure du *Cysticercus fasciolaris* (pl. 1). Dans la portion antérieure, il est ainsi composé. La musculature sous-cuticulaire est normalement constituée. La musculature longitudinale est le plus souvent représentée par une ligne de faisceaux occupant la partie médiane du parenchyme cortical, puis par une autre couche de puissants faisceaux à la partie interne de ce parenchyme. Ces couches se confondent sur les bords. Cette disposition offre des variations: la couche médiane et même la couche interne peuvent être moins ordonnées et l'on observe alors un grand nombre de faisceaux épars dans tout le parenchyme cortical. Cet aspect se verra surtout plus tard, chez le Ver adulte. La musculature transverse est aussi très développée et se trouve constitué par plusieurs fibres continues. Cette régularité est moins marquée chez le Ver adulte. La musculature dorso-ventrale est représentée par de nombreuses fibres isolées, disposées sans ordre.

La portion postérieure se distingue de la précédente par un système musculaire beaucoup moins développé. La musculature longitudinale, examinée sur des coupes transversales intéressant l'extrémité postérieure, ne comprend que les faisceaux de la couche interne du parenchyme cortical, bien moins gros que dans la portion antérieure. Les musculatures transversale et dorso-ventrale sont réduites à quelques fibres.

Lorsqu'on tente d'observer la scission *in vitro*, les résultats sont peu concluants. Au bout de quatre heures à 38°, dans un mélange de suc intestinal de Chat et d'eau physiologique, la partie postérieure montre un début de macération, mais les anneaux sont encore mobiles et n'ont aucune tendance à la rupture. Au bout de 20 heures, les larves sont mortes ou affaiblies et la scission ne s'est pas produite. En réalité, elles ne vivent pas assez longtemps dans ce milieu artificiel pour s'y comporte comme chez leur hôte.

En faisant absorber des cysticerques à de jeunes Chats qui sont ensuite sacrifiés en série, on observe les faits suivants.

Au bout de 7 heures, la vésicule terminale est disparue, la partie postérieure n'est pas encore détachée. Le nombre d'anneaux est de 355, la longueur en bonne extension de 131 mm. La partie antérieure a la structure décrite ci-dessus, quant à la postérieure elle présente une désorganisation de tout le système musculaire, déjà pauvrement figuré comme nous l'avons dit. Cette désorganisation intéresse également le parenchyme et va en s'accentuant à mesure que l'on s'approche de l'extrémité postérieure du Ver.

Au bout de 13 heures, la portion postérieure n'est toujours pas détachée. Dans l'eau tiède, elle se montre à peine mobile, tandis que l'antérieure est animée de mouvements vifs. On compte 278 anneaux, la longueur est de 125 mm.

Au bout de 19 heures, la portion postérieure vient de se détacher, mais elle est déjà digérée et l'on n'en trouve pas trace dans l'intestin ni dans les selles. L'extrémité du Ver porte les marques de rupture. En coupes transversales, cette extrémité montre d'abord un système musculaire bien développé, du type décrit précédemment, puis au niveau même de la déchirure, on constate une désorganisation du parenchyme médullaire, créant une perforation qui s'agrandit; finalement il ne reste plus qu'une couronne de parenchyme cortical qui disparaît à son tour. La rupture commence donc par la partie médiane, sans doute moins résistante parce que dépourvue de faisceaux musculaires.

Au bout de 20 heures, même aspect, la portion terminale est constituée de la même façon.

A ce moment (19 et 20 heures), par suite du détachement de la partie postérieure, le nombre des anneaux a diminué, mais dans des proportions tout à fait irrégulières. Sur trois échantillons, nous comptons respectivement: 50, 182, 198 anneaux; ils mesurent 15, 72, 85 mm. en bonne extension. En somme, le rapport entre les deux portions du cysticerque semble n'avoir aucune fixité.

Au bout de 4 jours, le Ver mesure 52 mm., nous comptons 104 anneaux. Vers le quarantième, on commence à apercevoir une tache embryonnaire centrale. Dans les derniers segments, elle s'est allongée et communique avec un cordon cellulaire qui se rend à l'un des bords, ébauche des conduits génitaux. Le dernier anneau a perdu toute trace de rupture, son bord postérieur est régulièrement arrondi. La vésicule excrétrice terminale est formée. La structure musculaire est caractéristique de la portion antérieure du cysticerque.

Enfin, un *Taenia taeniaeformis* adulte et mûr, fixé en bonne extension, mesurant 640 mm. et comprenant 336 anneaux, montre également un système musculaire bien développé, comme celui de la portion antérieure du cysticerque. Toutefois, ainsi que nous l'avons fait remarquer précédemment, les faisceaux y sont disposés d'une façon moins régulière que dans la larve, peut-être à cause de la compression exercée, de l'intérieur vers l'extérieur, par les organes sexués qui remplissent le parenchyme médullaire.

En somme, la scission de *Taenia taeniaeformis*, peu après son introduction dans l'intestin de l'hôte définitif, s'opère bien, comme l'avait déjà vu Leuckart. Mais la totalité des anneaux ne disparaît pas. Seule la partie postérieure est digérée; la partie antérieure, suivant immédiatement le scolex, persiste et se développe.

Le rapport entre ces deux portions n'est pas fixe. La longueur des

fragments et leur nombre d'anneaux sont très variables, et la scission peut se produire à une distance plus ou moins éloignée du scolex.

RÉSUMÉ

Le plérocercoïde de *Diphyllobothrium erinacei europaei*, arrivant chez son hôte définitif, perd sa partie postérieure, qui se différencie de l'antérieure par sa plus faible teneur en corpuscules calcaires et son système musculaire moins développé. Seule la partie antérieure se développe et donne le Ver adulte.

Il en est de même de *Taenia taeniaeformis*.

Le plérocercoïde de *Ligula intestinalis* se développe sans aucune perte de substance, soit dans l'hôte définitif, soit artificiellement en culture.

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Planche 1

Fragments de coupes transversales, montrant la musculature de *Cysticercus fasciolaris* (Rud.) et de *Taenia taeniaeformis* Bach, au cours de son développement.

Fig. 1 — Portion antérieure de *C. fasciolaris*.
C — cuticule et musculature sous-cuticulaire: Ml — musculature longitudinale représentée par une ligne de faisceaux au milieu du parenchyme cortical et une couche plus dense à la partie interne de ce parenchyme; Mt — musculature transverse figurée par de nombreuses fibres.

Fig. 2 — Portion postérieure de *C. fasciolaris*.
Ml — musculature longitudinale réduite à une rangée de faisceaux; Mt — musculature transverse représentée par quelques fibres.

Fig. 3 — Portion antérieure de *T. taeniaeformis* au bout de sept heures.
Ml — musculature longitudinale représentée par des faisceaux disposés en deux couches principales; Mt — musculature transverse bien développée.

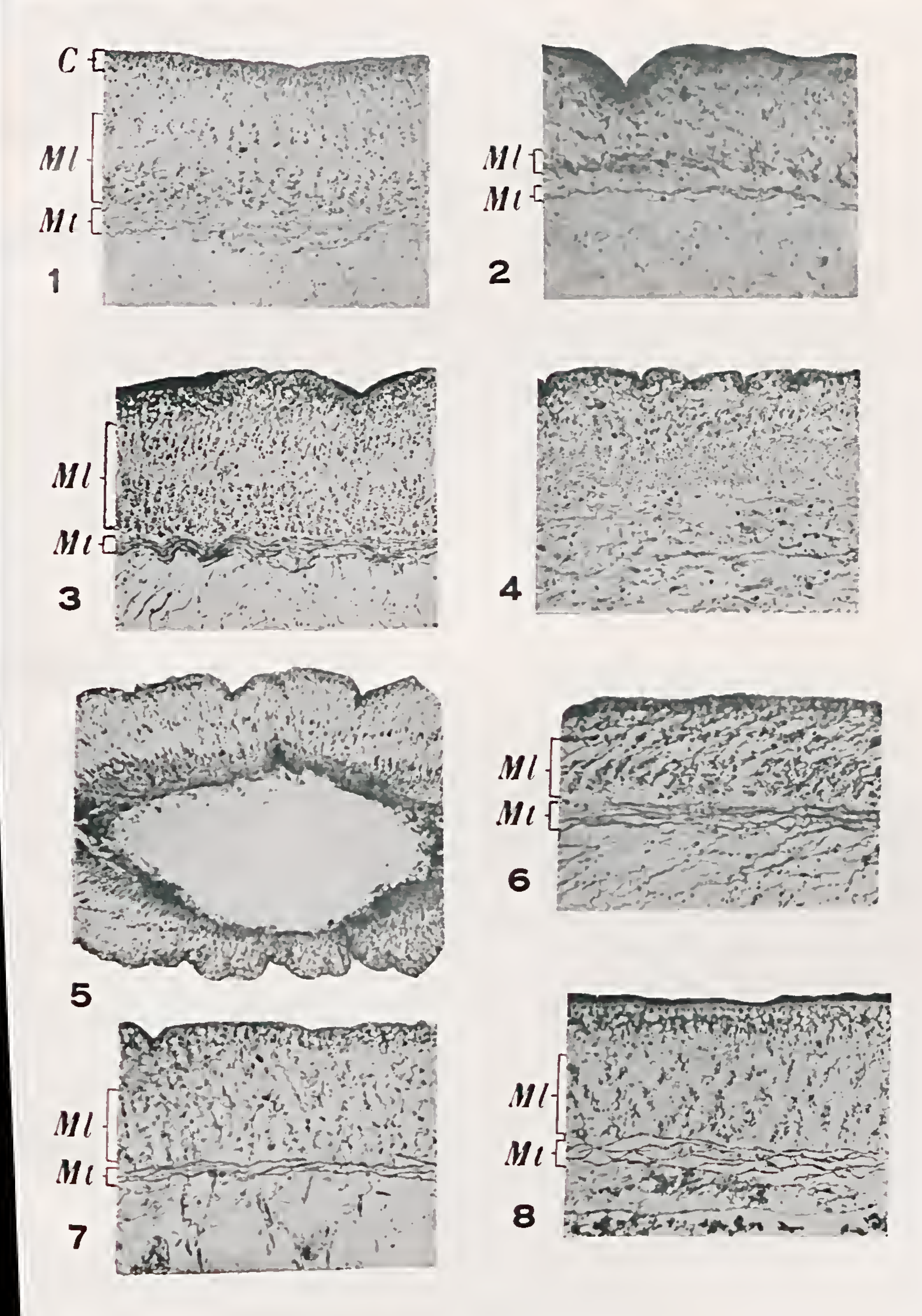
Fig. 4 — Portion postérieure de *T. taeniaeformis* au bout de sept heures. Les muscles et le parenchyme sont en voie de désorganisation.

Fig. 5 — Extrémité postérieure de *T. taeniaeformis* au bout de dix-neuf heures. Coupe au niveau du point de rupture. Le parenchyme médullaire est disparu, seule la partie corticale de l'anneau persiste encore.

Fig. 6 — Extrémité postérieure de *T. taeniaeformis* au bout de vingt heures, au-dessus du point de rupture.
Ml — musculature longitudinale représentée par des faisceaux principalement condensés à la partie interne du parenchyme cortical; Mt — musculature transverse bien développée.

Fig. 7 — Musculature de *T. taeniaeformis* adulte, anneau sexué.
Ml — musculature longitudinale, faisceaux disposés sans ordre dans le parenchyme cortical; Mt — musculature transverse représentée par plusieurs fibres.

Fig. 8 — Musculature de *T. taeniaeformis* adulte, anneau mûr.
Ml — musculature longitudinale, faisceaux disposés sans ordre dans le parenchyme cortical; Mt — musculature transverse à fibres irrégulièrement ordonnées.



Joyeux & Baer: Développement des Cestodes.

Some nematode parasites of lizards

J. N. Karve, M. Sc.
Department of Biology, Sir Parashurambhau College, Poona — India

[With 2 plates]

The present paper is based on material obtained from the gecko *Hemidactylus flaviviridis* (Ruppel) and the common lizard *Calotes versicolor* (Daudin). Both the hosts are rich in nematodes. Comparatively the intensity of parasitization is less in *C. versicolor*. Every specimen of the gecko dissected, harboured, at least, one species of the roundworms; while it was not unusual to find specimens of *C. versicolor* totally devoid of parasites of any kind. The study of these worms revealed the presence of four species, two of which appear to be new.

Thubunaea dactyluris n. sp.

(Pl. 1, figs. 1-4).

These parasites were obtained in large numbers from the stomach of the two hosts. The description given here is based on the specimens collected from the gecko.

The worms are delicate and slender in appearance and taper more towards the anterior extremity. Male measures 6-8.7 mm. in length with a maximum thickness of 0.1875 mm. The female is 11.5-19.1 mm. long and 0.31 mm. in maximum thickness. There are two simple lateral lips. The left one is smaller and bears three forwardly directed teeth on its inner surface. The middle tooth is stout and bent somewhat laterally. The other two teeth are slender and their tips do not come up to the level of the tip of the stout tooth. Each lip bears three papillae. At the base of the lips there is a cuticular collar about 0.05 mm. in diameter. Just behind the collar there is a girdle formed by papillae. In the dorsal or ventral view six papillae appear to be present while in the lateral view only four could be observed.

Pharynx is present. The oesophagus is divided into two parts: an anterior muscular and a posterior glandular one. The distance from the anterior extremity to the end of pharynx is 0.024-0.0336 mm., to the end of muscular oesophagus is 0.263-0.353 mm. and to the end of glandular portion of the oesophagus, is 2.063-3.55 mm. The nerve ring is situated at 0.195-0.233 mm. from the anterior end. The prominent cervical papillae and the excretory pore are at 0.203-0.21 mm. and 0.255-0.3 mm. respectively from the same end.

The caudal end of the male possesses well developed alae and is curved towards the ventral side. The ventral surface of the tail end is covered with numerous papilliform elevations of the cuticle. These begin at the level where caudal alae originate and extend a little beyond the third postanal pair of

the sessile papillae. The portion beyond this, to the tip of the tail is devoid of them. Laterally, in majority of the specimens, these elevations fuse to form cuticular ridges running antero-posteriorly. The tail measures about 0.22 mm. and the extremity is rounded. There are ten pairs of caudal papillae, four of which are pedunculate. Three pairs of the stalked papillae are preanal and one postanal. Of the six pairs of sessile papillae, only one is preanal and the remaining postanal. The spicules are small, unequal and chitinized. The right measures 0.045-0.075 mm. and the left which is longer, is 0.07-0.105 mm. Accessory piece appears to be absent.

The tail of the female is conical and measures 0.195-0.2 mm. The caudal papillae are at a distance of about 0.06-0.08 mm. from the posterior end. The vulva is at a distance of 3-3.9 mm. from the anterior end and has feeble lips. Its position is somewhat variable. It is situated in the region where the oesophagus opens into the intestine by means of a valvular apparatus. In some specimens the vulva is placed a little anterior to the junction of the oesophagus with the intestine; while in others it is at the level of the junction or somewhat posterior to it. The muscular vagina runs somewhat obliquely backwards and at a distance of 0.188 mm. from the vulva (in a specimen measuring 16.5 mm.) dilates into an egg-reservoir 0.375 mm. long. It is packed with eggs and has muscular walls. In some specimens the egg-sac is not well marked. The two uterine branches arise from the reservoir at a distance of 0.593 mm. from the vulva. They are narrow at the beginning but soon dilate and run posteriorly parallel throughout their length to end in the ovarian coils, situated towards the caudal end. The eggs, which measure 0.0304-0.032 mm. × 0.0176-0.0224 mm., have thick shells and contain larvae at deposition.

The material from *C. versicolor* resembles that from *H. flaviviridis* in all respects.

This species bears a striking resemblance to *T. asymmetrica* Baylis, 1930 It is however distinguished from the latter by the following characters:

1) — The middle tooth on the left lip is stout and bent somewhat laterally.
2) — Both the lips possess three papillae each.
3) — A number of papillae forming a sort of ring immediately behind the collar.
4) — Number and arrangement of the caudal papillae in the male.
5) — The tuberculated area, on the ventral side of the caudal end of the male does not include all the pairs of papillae but extends a little beyond the third postanal pair of the sessile papillae.

Thubunaea dactyluris is, therefore, a new species.

HOSTS: — *H. flaviviridis* and *C. versicolor.*
HABITAT: — Stomach.
LOCALITY: — Nagpur (Central Provinces) and Poona.

Patwardhan (1935) has recorded nematodes collected at Nagpur from the intestine of *H. flaviviridis*, which he refers to the species *T. asymmetrica.* On going through the brief description given by Patwardhan, the writer is

of opinion that the worms recorded by him really belong to the species *T. dactyluris* and not to *T. asymmetrica*.

Thelandros maplestoni (Chatterji, 1933).
(Pl. 2, figs. 1-7).

In 1933 Chatterji described a nematode *Parapharyngodon maplestoni* from the intestine of a Burmese lizard *Calotes versicolor*. He erected the genus *Parapharyngodon* to accommodate the species. Baylis (1936), however, has rightly pointed out that the generic characters of *Parapharyngodon* are the same as those of *Thelandros*. He has, accordingly, transferred the species *maplestoni* from the genus *Parapharyngodon* to *Thelandros*.

The writter collected a large number of nematodes from the rectum of the two hosts, which he refers to *Thelandros maplestoni* (Chatterji, 1933). The material in his collection, however, shows certain characters which are not mentioned in the original description and it was, therefore, thought desirable to compare these worms with Chatterji's specimens. Through the kindness of Mr. Chatterji a single male and a few females from his material were available for study. On examination, Chatterji's material was found to agree in all the essential points with the specimens in the writer's collection. Though the worms in both the collections belong undoubtedly to the same species the writer feels it necessary to give a redescription of the worms in view of the presence of certain characters not mentioned in Chatterji's description.

The description given below is based upon the worms from the gecko.

The male measures 1.995-2.9 mm. in length and 0.217-0.33 mm. in maximum thickness. The female is 5-7.75 mm. long with a maximum thickness of 0.5-0.756 mm. Lateral alae are present in male and absent in female. They begin approximately at a distance of 0.3-0.5 mm. from the anterior extremity and end at about 0.06-0.13 mm. in front of the posterior end (excluding the dorsal process). The transverse striations on the cuticle are coarse and rather deep and consequently the body appears ringed. The mouth is surrounded by three bilobed retractile lips, each lobe carrying a single papilla. (The lips according to Chatterji are three, simple, without papillae).

The pharynx is slightly broader than the oesophageal tube and its lumen is triradiate. The anterior end of the pharynx bears three teeth, situated one on each sector. (Chatterji has not mentioned the presence of the pharynx and the pharyngeal teeth). The oesophagus ends in a bulb which is demarcated from the tubular portion by a slight constriction. The distance from the anterior end to the end of the bulb is 0.39-0.478 mm. in the male and 1.095-1.3013 mm. in the female. The bulb is about as much long as it is wide and measures 0.0736-0.0861 mm. × 0.0812-0.0861 mm. in the male and 0.18-0.2 mm. × 0.2025-0.243 mm. in the female. It is sunk in the expanded anterior end of the intestine. The nerve ring is situated at 0.064-0.07 mm. in the male and at 0.165-0.18 mm. in the female from the anterior extremity. The excretory pore is situated behind the broad initial portion of the intestine and its distance from the front end is 0.412-0.54 mm. in the male and 1.3125-1.956 mm. in the female.

The caudal end in the male is curved ventrally. It does not bear alae. A dorsal process, measuring 0.07-0.11 mm. in length, is present on the tail.

The cloacal opening is situated on a prominence at the end of the tail. This prominence is not well marked in some specimens. There are five pairs of caudal papillae present. (Chatterji mentions only three and a median post-anal papilla). One of these pairs is preanal and situated just in front of the cloacal aperture. Of the two adanal pairs, one is large and laterally situated. The other pair is comparatively small and is situated by the side of the posterior lip of the cloacal aperture. There are two postanal pairs; one immediately behind the cloacal opening and the second borne by the dorsal caudal process near its base and ventral in position. There is no median post-anal papilla. The single spicule is straight or slightly bent, chitinised and measures 0.0448-0.09 mm in length. The tip of the spicule may be pointed or blunt. The same batch of specimens from a single host contains males showing this variation in the tip of spicules.

The tail of the female ends in a large spine curved towards the dorsal side. Its length, together with the spine, is 0.4-0.55 mm. At the base of the spine or a little above it, there is a single pair of caudal papillae. Almost at the same level with this pair there appears to be a single dorsally situated papilla. The writer is not certain whether this is a single or really a pair of papillae. The vulva is situated at 2.4-3.255 mm. from the anterior end. Its lips are not well developed. The muscular vagina runs posteriorly and at about 0.35-0.45 mm. from the vulva gives out the two parallel uterine branches. A little behind the vulva the vagina somewhat dilates to form an ovejector. The terminal portion of the ovaries coils round the oesophagus in front of the bulb. The eggs are elliptical, convex on oneside and flattened on the other. At one pole there is a slight internal thickening of the shell, which is striated. (Unfortunately Chatterji has chosen for his figure, a view, which does not bring out the peculiarities of the egg). The eggs measures 0.072-0.095 mm. × 0.0384-0.042 mm. and their contents, at deposition, show segmentation.

HOST: — *Hemidactylus flaviviridis* and *Calotes versicolor*.
HABITAT: — Rectum.
LOCALITY: — Nagpur (Central Provinces) and Poona.

Patwardhan (1935) has described a nematode, *Thelandros hemidactylus* from the rectum of *H. flaviviridis*. His material is obtained from the same host as that of the writers. Even the locality and the habitat of the parasites are the same.

Through the courtesy of Prof. Karam Singh, the writer got an opportunity to study the types and co-types of *Thelandros hemidactylus* deposited by Dr. Patwardhan in the Zoology Department of the College of Science, Nagpur.

An examination of these worms showed that they were identical with the specimens whose description is given above.

There are, however, certain points in Patwardhan's description which require consideration.

Lateral alae are stated to be absent in *Thelandros hemidactylus*. This is true for the females but all the males in Patwardhan's material show undoubtedly the presence of lateral alae. The funnel, which is said to be situated at the anterior end of the oesophagus, is altogether absent in a number of specimens in Patwardhan's material. Even the specimens from Burma do not show it.

All measurement in mm.

MEASUREMENTS	T. (*Parapharyngodon*) *maplestoni*		*Thelandros hemidactylus*		*T. maplestoni* from the writer's material	
	Male	Female	Male	Female	Male	Female
Total Length	1.98 - 2.6	3 - 5.2	2.8 - 3	6.1 - 6.4	1.995 - 2.9	5 - 7.75
Maximum thickness	0.22	0.36 - 0.45	0.24 - 0.28	0.7 - 0.76	0.247-0.33	0.525 - 0.756
Length of the Oesophagus to the end of the bulb	0.45 - 0.54	0.83 - 1.03	0.57 - 0.62	1.09 - 1.1	0.39 - 0.478	1.095 - 1.3013
Length of the bulb	—	—	—	—	0.0736 - 0.0857	0.18 - 0.2
Width of the bulb	0.09 - 0.11	0.15 - 0.198	0.1	0.2	0.0842 - 0.0864	0.2025 - 0.243
Nerve ring, from anterior end	0.11	0.13 - 0.152	0.07 - 0.075	0.13-0.14	0.061 - 0.07	0.165 - 0.18
Excretory pore from anterior end	—	1.35	0.75	1.62	0.412 - 0.54	1.312 -1.956
The caudal process in the male	0.1 roughly from figure	—	0.079	—	0.07 - 0.11	—
Length of the spicule	0.076 - 0.09	—	0.051-0.056	—	0.0448 - 0.09	—
Tail	—	0.31 - 0.4	—	0.079	—	0.335 - 0.44
Situation of the Vulva	—	—	—	3 - 3.2	—	2.4 - 3.255
Eggs	—	0.042 - 0.05 × 0.08 - 0.09	—	0.081-0.094 × 0.041	—	0.072 - 0.095 × 0.0384-0.042

In only a few of Patwardhan's and the writer's specimens, the lumen of the pharynx appears to have become slightly dilated at the anterior end; but this is probably due to the variations in expansion and contraction at the time of fixing the material. Had it been a constant character all the specimens would have shown it. The writer is, therefore, of opinion that the presence of the funnel at the anterior end cannot be accepted as a reliable specific character. Only four pairs of caudal papillae are described to be present; but male worms in Patwardhan's material show the presence of five pairs of papillae instead of four. As regards the « swollen knob-like prominent process » present on the posterior lip of the cloacal opening, the writer has not been able to observe it either in the Burmese or in his material. Even in Patwardhan's material only the type specimen of the male shows this « knob-like process » but it is in reality one of the two large papillae laterally placed in the adanal region.

It would also be seen from the measurements given in the comparative table that *Thelandros hemidactylus* Patwardhan, 1935 is identical with *Thelandros maplestoni* (Chatterji, 1933). The latter name stands for the species as it has the priority.

Strongyluris karawirensis n. sp.

(Pl. 1. figs. 5-8).

Four males and a single female of this species were found in the rectum of *Calotes versicolor* by Prof. Paramdekar of the Biology Department of the Rajaram College, Kolhapur, which he very kindly handed over to the writer for determination.

The male measures 16-18.55 mm. in length and 1.05-1.1 mm. in maximum thickness. The single female is 23.25 mm. long and has a maximum thickness of 1.13 mm. The head appears to be retractile and is rather small for the size of the body in both sexes. Its diameter is 0.055-0.07 mm. in the male and 0.08 mm. in the female. The mouth is surrounded by three lips, each of which has an anteriorly projecting and two lateral cuticular expansions.

The dorsal lip bears two papillae and the two subventral lips one each. A neck is present but it is not so well pronounced in the male as it is in the female. Transverse cuticular striations are exceedingly fine. Cervical papillae have not been observed.

The pharynx measures 0.17-0.2 mm. in the male and 0.26 mm. in the female. The oesophagus is divided into two parts: an anterior tubular portion and a posterior bulb. The entire oesophagus is 1.35-1.41 mm. in the male and 1.70 mm. in the female. The diameter of the bulb, measured dorsoventrally, is 0.19-0.2 mm. in the male and 0.25 mm. in the female. The intestine from its starting point to a short distance posteriorwards, is very wide. Its diameter suddenly diminishes beyond this. It again widens out a little behind the rectum to form a globular swelling. The nerve ring is situated at 0.42-0.44 mm. in the male and at 0.51 mm. in the female, from the anterior extremity. The excretory pore is small and in male its distance measures 1.04-1.11 mm. and in the female 1.34 mm. from the same end.

The caudal end of the male bears a terminal spike, is obliquely truncate and curved ventrally. The tail in the male with the spike, measures about 0.11

mm. A large preanal sucker is present. It is 0.11 mm. wide and 0.09 mm. deep. The posterior edge of the chitinized wall of the sucker bears a notch. There are eleven pairs of caudal papillae which appear crowded on account of their arrangement and the large size of some of them. Seven pairs of these caudal papillae are postanal, one is adanal and the remaining three are preanal, and parasuctorial. The size of these papillae appears to gradually decrease from behind forwards. Three pairs of postanal papillae are ventral in position, two being situated immediately behind the cloacal opening and one near the tip of the tail. One pair near the caudal tip is subventral. The remaining postanal pairs are more or less lateral. The equal spicules are covered with tubercles, except at the distal ends which are rounded. The length of the spicules is 0.57-0.59 mm.

The tail of the female is short and measures 0.18 mm. It is bluntly rounded and bears a terminal spike similar to that in the male. There is a pair of large caudal papillae at about 0.03 mm. from the posterior end including the spike). The vulva has prominent lips and is at a distance of 9.1 mm. from the caudal end. The muscular vagina runs a little forwards and forming a loose coil runs posteriorly. The uterine branches are parallel. The eggs measure 0.07-0.085 mm. × 0.05-0.055 mm. They have thick shells which slightly thickened internally at the two poles.

The species appears to occupy a position intermediate between the two Indian species *S. chamaeleonis* and *S. calotis*. As far as the number of papillae are concerned, it bears a resemblance to *S. paronai*. Unfortunately Stossich's original description of his species was not available to me.

HOST: — *C. versicolor*.
HABITAT: — Rectum.
LOCALITY: — Kolhapur (Bombay Presidency).

Physaloptera sp.

Three immature females apparently belonging to the genus *Physaloptera*, were found encysted in the muscles of the dorsal body wall of *H. flaviviridis*. It is not possible to refer these specimens to any definite species.

I take this opportunity of expressing my best thanks to Prof. Parandekar for the specimens of *S. karawirensis*, to Mr. Chatterji of the Helminthological Institute, Rangoon University for having sent me some specimens of *Thelandros maplestoni* from his collection, and to Prof. Karam Sing for placing at my disposal Dr. Patwardhan's specimens.

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Plate 1

Fig. 1 — *Thubunaea dactyluris*. Dorsal view of the anterior end of the female. C. — collar; T — the middle tooth on left lip; Ph. — pharynx; O — oesophagus.

Fig. 2 — *Thubunaea dactyluris*. Lateral view of the anterior end of the female. C. — collar, seen in optical section; P1, P2 and P3. — the three papillae situated on the left lip; T[1] — one of the two smaller teeth present on the left lip.

Fig. 3 — *Thubunaea dactyluris*. Ventral view of the caudal end of the male (from *H. flaviviridis*) showing the arrangement of the papillae. S. — tips of spicules.

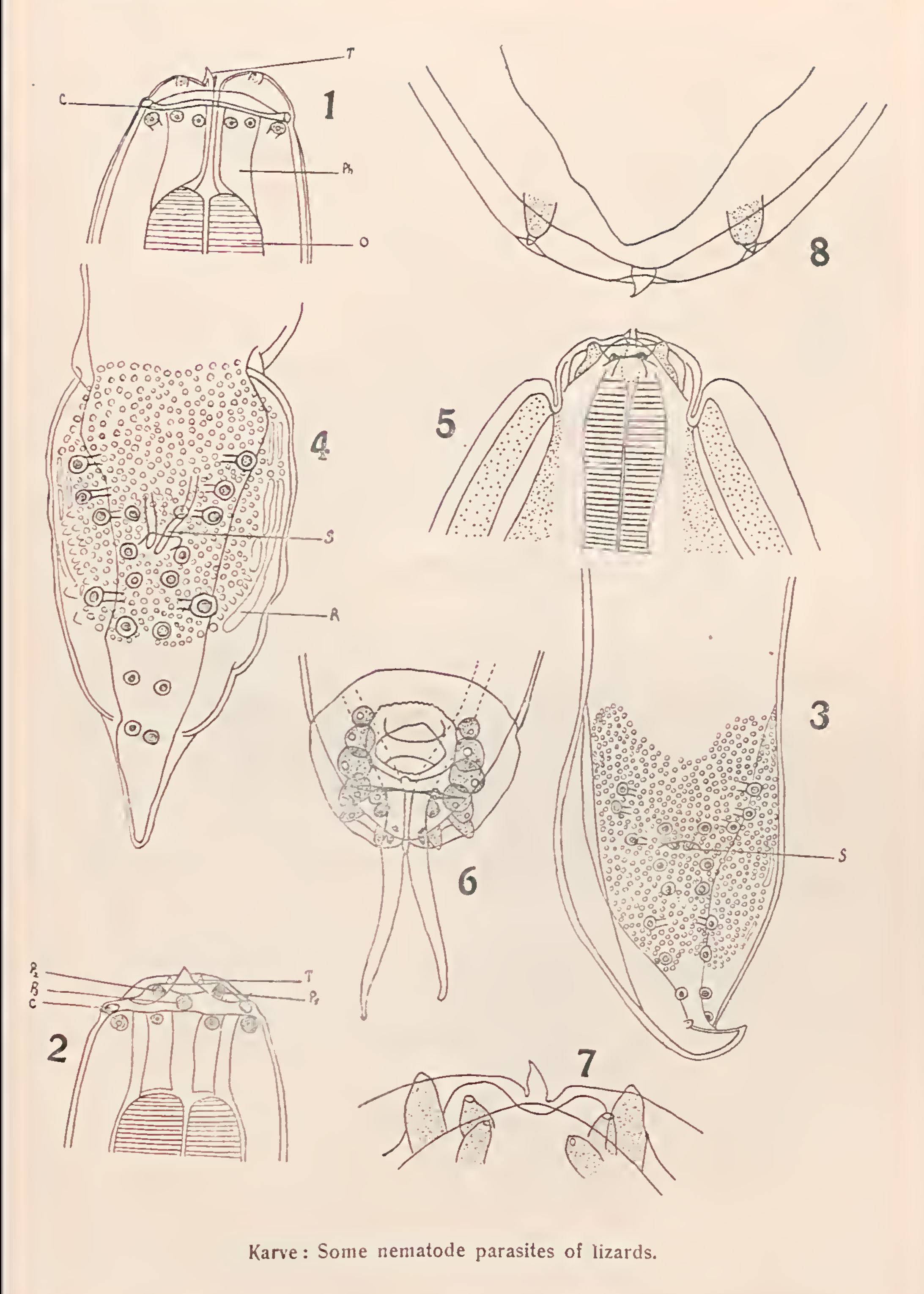
Fig. 4 — *Thubunaea dactyluris*. Ventral view of the caudal end of the male (from *C. versicolor*) showing the spicules and papillae. R — ridges formed by the fusion of the cuticular prominences; S. — left spicule.

Fig. 5 — *Strongyluris karawirensis*. Dorsal view of the anterior end of the female.

Fig. 6 — *Strongyluris karawirensis*. Ventral view of the caudal end of the male.

Fig. 7 — *Strongyluris karawirensis*. Ventral view of the caudal end of the male under higher magnification.

Fig. 8 — *Strongyluris karawirensis*. Ventral view of the caudal end of the female.



Karve: Some nematode parasites of lizards.

Plate 2

Fig. 1 — *Thelandros maplestoni*. Ventral view of the anterior end of the female (drawn from Chatterji's material).
Pt. — pharyngeal teeth; Ph. — pharynx; O. — oesophagus.

Fig. 2 — *Thelandros maplestoni*. End-on view of the anterior extremity of the female (from Chatterji's material), showing the bilobed lips and the papillae.

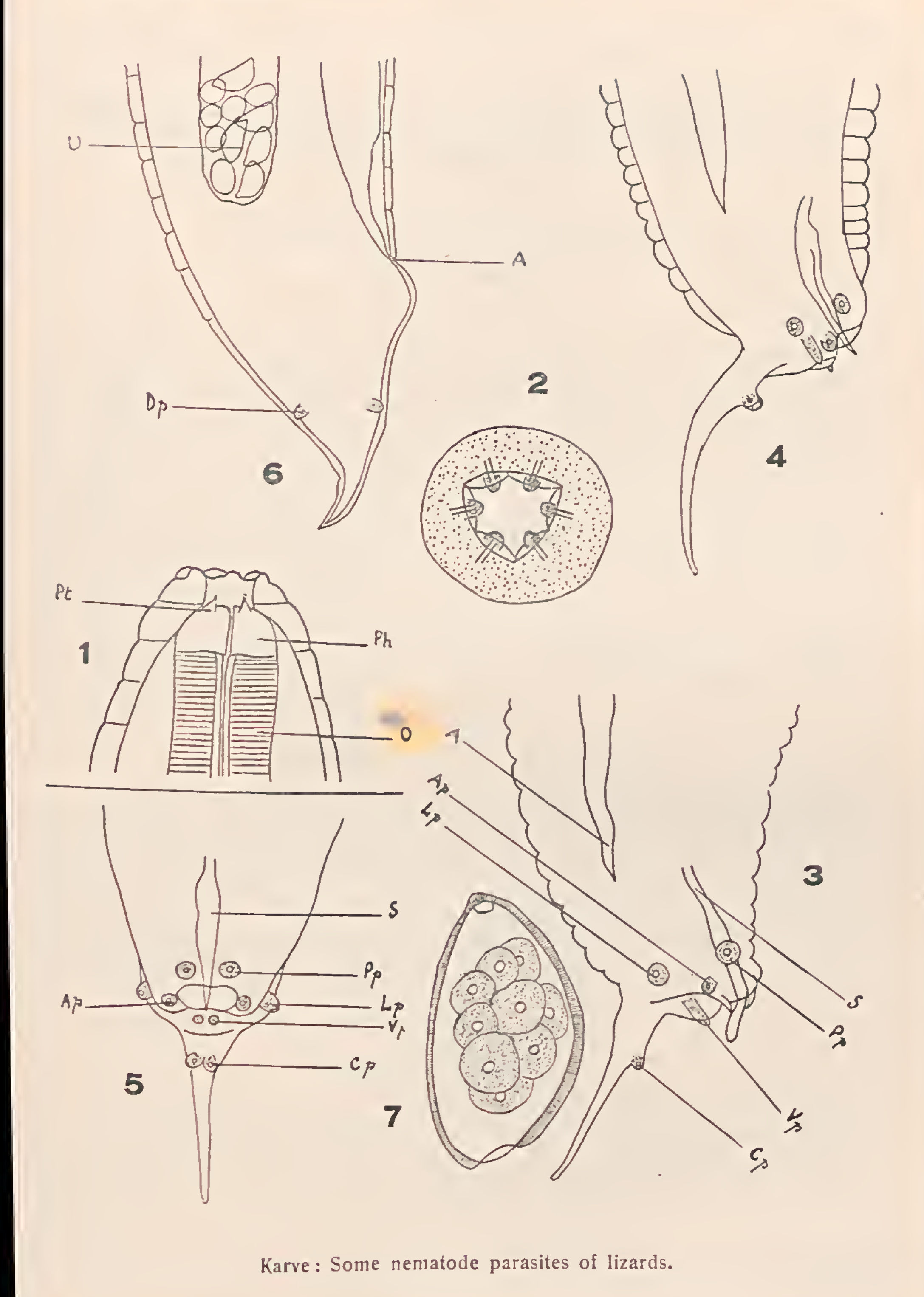
Fig. 3 — *Thelandros maplestoni*. Lateral view of the caudal end of the male (from Chatterji's material).
A. — ala; Ap. — small adanal pair of papillae; Cp. — pair of papillae situated on the dorsal caudal process; Lp. — lateral pair of large papillae adanal in position; Pp. — preanal pair of papillae; S. — spicule; Vp. — ventral postanal pair of papillae.

Fig. 4 — *Thelandros maplestoni*. Lateral view of the caudal end of the male (from the writer's material), showing the same structures as in fig. 3.

Fig. 5 — *Thelandros maplestoni*. Ventral view of the caudal end of the same male sketched in fig. 4. Lettering the same as in fig. 3.

Fig. 6 — *Thelandros maplestoni*. Lateral view of the tail of the female (from the writer's material).
A. — anus; Dp. — dorsal caudal papilla; U — loop of the uterine branch.

Fig. 7 — *Thelandros maplestoni*. Egg.



Karve: Some nematode parasites of lizards.

On a new species of Psilorchis from the intestine of the common teal, Nettion crecca

M. B. Lal, D. Sc.
Department of Zoology, The University, Lucknow, India.

[With 1 text-figure]

Odhner (1913) erected the family *Psilostomidae* for the reception of the subfamily *Psilostominae* of Lühe (1909) and several new genera created by himself. Travassos (1921) added the genus *Lyperorchis* under the family and Bhalerao (1931) described another genus *Testifrondosa*, from the intestine of pig. Thapar & Lal (1935) reported the genus *Psilorchis*, the only avian trematode recorded in India under the family. During the course of his investigations on the Avian Trematodes, the writer had the privilege of collecting a number of parasites from the intestine of the common teal, *Nettion crecca* shot by Dr. G. S. Thapar near Ajgain, about 25 miles from Lucknow. The form collected conforms to the characters of the genus *Psilorchis* but appears to be new to Science and is being described here as *Psilorchis ajgainis* n. sp.

The author wishes to record here his sincere thanks to Dr. G. S. Thapar for his kindly advice and valuable criticisms as also for allowing the collection of the parasites from the birds shot by him.

Psilorchis Thapar & Lal, 1935.

Diagnosis. — *Psilostomidae* with leaf-like body. Ventral sucker much larger than the oral. Short Y-shaped excretory bladder. Genital pore, dextral, in front of the ventral sucker. Testes more or less bean-shaped and tandem; each testis provided with a well-developed funiculus which leads forward into a vas deferens. Receptaculum seminis absent. A yolk reservoir present. Uterine coils lie in front of the testes. Vesicula seminalis retort-shaped, situated in front of the ventral sucker; cirrus short. Vitellaria behind the ventral sucker and do not meet those of the other side posteriorly.

TYPE SPECIES: — *Psilorchis indicus.*

Psilorchis ajgainis n. sp.

The body of this trematode is long, flattened, leaf-like and gradually tapers towards either end. It is 6.65 mm. in length and has a maximum breadth of .75 mm., which is at level of middle of the body. The body is covered over with thin cuticle which is smooth and does not bear any scales or spines.

The mouth opening is ventrally situated at the anterior end and is surrounded by a small oral sucker which is almost circular and measures .2 mm. in diameter. The ventral sucker is strong and powerful and is much



Fig. 1 — *Psilorchis ajgainis.* Ventral view.

larger than the oral sucker and measures .65 mm. × .55 mm. The genital pore opens in front of the oral sucker, between it and the intestinal bifurcation.

The mouth leads into an extremely small prepharynx. The pharynx is globular, thick-walled and muscular and is .1 mm. in diameter. This is followed by a small oesophagus, .125 mm. long; and this latter bifurcates into two intestinal caeca, running laterally to the posterior end of the body, and ending blindly at a short distance from it.

The excretory pore is situated at the posterior end of the body and leads into a Y-shaped excretory bladder. The two horns of the 'Y' lead into long excretory ducts which ramify in the body of the animal.

There are two testes, more or less bean-shaped, situated behind the ovary and are tandem in position. Each testis is provided with a well-developed funiculus that leads forward into a narrow vas deferens. The origin of the vas deferens is rather peculiar in this species. The base of the vas deferens is coiled on itself in the case of anterior testis but in the posterior it forms the elongated and distally tapering process. The anterior testis is situated behind the ovary at a distance of .325 mm. and measures .65 mm. by .375 mm. The posterior testis measures .7 mm. by .425 mm. in size.

The vesicula seminalis, formed by the union of the two vasa deferentia, lies close to the anterior margin of the ventral sucker and slightly overlapping it. It is retort-shaped and anteriorly leads into a short ductus ejaculatorius and the cirrus. It opens at the genital pore close to the opening of the metraterm, the opening being slightly dextral, situated between the intestinal bifurcation and the acetabulum.

The ovary is spherical and is situated at about the middle of the body. It measures .25 mm. in diameter. From its posterior end, arises a small narrow oviduct, which after a short course opens into the ōotype which is surrounded by a large number of unicellular shell-gland. There is no receptaculum seminis in these forms.

The vitelline glands are distributed behind the ventral sucker, as large follicles laterally on either side of the body to the posterior end. These glands are ventral to the intestinal caeca. They all lead by their minute ducts into two transverse vitelline ducts on either side, which at the level of the ōotype pour their yolk into a small flask-shaped yolk reservoir from which a small duct leads into the ōotype.

The uterus arises from the right side of the ōotype and forms an anterior loop round the latter. It then turns round and runs forwards passing below the ovary. Later, it follows a zig-zag course forwards and ends in an elongated metraterm which opens at the genital pore in front of the ventral sucker. The eggs are large, oval structures measuring .1-.125 mm. by .04-.05 mm.

REMARKS

This species differs from *Psilorchis indicus* the type species, in possessing highly developed funicular testes, in the coalescence of the vesicula seminalis with the ventral sucker, in having extremely small prepharynx and in the shape of ovary and vitellaria.

Key for the Identification of the species of the genus Psilorchis reported from India.

Cirrus sac adhering to the ventral sucker; ovary spherical.	*P. ajgainis.*
Cirrus sac separate from the ventral sucker; ovary oval.	*P. indicus.*

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Descripção de uma especie nova do genero Prionapterus Guérin, 1832

(Col. Prionidae)

Frederico Lane
Assistente do Museu Paulista — Brasil

[Com 1 estampa]

O Museu Paulista recebeu recentemente um material entomologico, na maior parte coleopteros, colligido por R. C. Shannon e J. Lane, durante o mez de Março do corrente anno, em Maracajú, Estado de Matto Grosso.

Dentre os coleopteros destaca-se um exemplar femea de um *Prionidae* muito curioso, que verifico pertencer a um genero ao que parece ainda não constatado no Brasil. Trata-se do genero *Prionapterus*, que conta até aqui com tres especies: *Prionapterus staphylinus* Guérin, 1832 e variedades, *P. woltersi* Bruch, 1925 e *P. breyeri* Bruch, 1929.

O Museu Paulista não possue um só exemplar das especies mencionadas, o que torna impossivel qualquer confronto do material. Outra difficuldade reside, a julgar pela litteratura consultada, na differenciação especifica ser muito mais segura neste genero com exemplares machos. Assim, Bruch na descripção do seu *P. breyeri*, procedente de Missiones, nota mesmo que si o macho é indubitavelmente caracteristico e inédito, a femea por outro lado apresenta muitissima semelhança com a de *P. staphylinus*. Opina que os exemplares deste sexo, procedentes do Paraguay, considerados por Gounelle e Lameere como femeas de *staphylinus*, devem pertencer a *breyeri*, já que procedem da mesma região geographica.

Sem material de confronto, tive no emtanto a felicidade de reunir quasi toda a bibliographia referente ao genero, cumprindo salientar o enorme auxilio que obtive dos trabalhos de C. Bruch pela sua clareza e farta illustração

O exemplar de Matto Grosso reune ao meu ver caracteres que justificam a sua descripção como especie nova.

Prionapterus travassosi sp. n.

Femea. — Côr negra, excepto pequena faixa entre a parte engrossada e o gume das mandibulas, que por transparencia mostra-se avermelhada. Os elytros abertos, vistos com luz forte, tomam a mesma côr. O abdomen na parte superior e basal é flavo, assim como a parte distal da genitalia. Opaco, excepto as pernas, as antennas, a parte média do metasterno e a parte média dos segmentos abdominaes na face ventral, sendo o ultimo segmento quasi inteiramente liso. Genitalia lisa.

Cabeça de conformação geral espherica, entre os olhos levemente de-

pressa, com um sulco sutural distincto do vertice ao clypeo, este fortemente concavo, com a borda anterior consequentemente recurva, a superior unida aos tuberculos das antennas, triangular. Mandibulas fortemente entumescidas e recurvas, agudas na extremidade, no meio do gume interno com um dente reforçado, lisas na ponta e margem interna, o resto fortemente pontuado. Olhos transversaes, finamente granulosos, longos, a borda anterior, fortemente sinuosa, a posterior quasi recta. Processos jugulares agudos. Mento enrugado. Palpos maxillares longos, os articulos semi-conicos, o 1.º articulo diminuto, o 2.º quatro vezes o comprimento do 1.º, subegual ao distal, o 3.º de comprimento um pouco menor, o distal cortado na extremidade, o contorno subcircular e a superficie concava.

Antennas de 18 mm., alcançando o ponto de confluencia das duas costellas internas dos elytros; de onze articulos, glabros, de pontuação grossa mas esparsa; o escapo mais grosso que os demais articulos, levemente conico e recurvo, ultrapassando um pouco, distalmente, o bordo posterior dos lobos superiores dos olhos; o 2.º articulo diminuto, annelar, subegual ao seu proprio nodulo basal; o 3.º longo, subegual ao 11.º, subcylindrico, engrossando um pouco distalmente, 1 1/4 vezes o comprimento do escapo; o 4.º mais curto que o escapo e os seguintes diminuindo progressivamente até o 10.º, que attinge apenas a metade do comprimento do 3.º. O 4.º articulo é apenas levemente anguloso no apice, os seguintes de 5 a 10 são francamente dentados em serra. Em baixo, no apice, o 3.º articulo apresenta um inicio de area porifera, que torna-se mais extensa nos articulos seguintes, irregular e interrupta por vezes nos articulos 4-6, já regular nos art. 7-11, onde occupa toda a extensão dessa face, de apice á base; ao longo da face exterior a pontuação torna-se mais junta e confluente nos apices dos articulos 3-6, só no 7.º nota-se verdadeira area porifera, mais extensa no 8.º e já occupando toda a face nos articulos seguintes; dorsalmente nota-se no 9.º articulo uma area porifera irregular, que nos articulos 10 e 11 occupa toda a face dorsal, o mesmo acontecendo com as faces internas, de modo que os dois ultimos articulos são francamente divididos em quatro faces poriferas separadas por estreitos filetes normaes. As areas são depressas e os filetes nos ultimos articulos muito estreitos, os externo-dorsaes mais largos um pouco, sendo o aspecto destes articulos bastante anguloso

Prothorax finamente granuloso, o pronoto transverso, pouco convexo, duas vezes mais largo que longo, a borda anterior levemente recurva para dentro, os cantos anteriores mais avançados, os bordos lateraes marginados, a margem fortemente revirada para cima e francamente tri-dentada; o apice do dente anterior encontra-se a altura da linha do terço anterior do pronoto, o do 2.º dente abaixo da linha mediana, o do 3.º em linha com a margem posterior do pronoto, esta mostra-se sinuosa, levemente revirada para cima, com uma pequena reentrancia preescutellar e duas lateraes. Uma linha mediana depressa corta de leve, longitudinalmente, o pronoto. Notam-se tambem duas pequenas depressões obliquas latero-posteriores. As pro-pleuras são largas e nitidamente marcadas do prosterno, os cantos posteriores fecham incompletamente as cavidades coxaes que são abertas. O prosterno, excepto o processo prosternal, fica anterior ás coxas deanteiras. O processo sobe em estreito filete, de bordos parallelos e carenados até ao nivel mais alto das coxas, cahindo depois, tambem obliquamente para o mesosterno em forma de lingueta em que a primeira metade é alargada e lisa, a segunda estreitada e obtusamente arredondada na ponta

e de superficie muito granulosa. O filete apresenta-se espesso no sentido dorso-ventral, separando perfeitamente as coxas. O pronoto apresenta na margem anterior e na posterior uma carreira de cerdas.

Escutello distalmente elevado para um plano superior, superpondo-se aos cantos internos dos elytros, que mostram uma depressão de encaixe correspondente; o apice é arredondado, a base alargada mostrando uma tenue linha depressa mediana.

Elytros longos, mais de quatro vezes o comprimento do pronoto, alcançando a base do ultimo segmento abdominal, que fica descoberto; unidos na linha sutural até quasi o apice e portanto só levemente dehiscentes; humeros sensivelmente quadrangulares, a margem humeral e a do primeiro terço lateral fortemente revirada para cima, depois apenas marginada; as quedas lateraes largas nos humeros e gradativamente estreitadas até mais ou menos o terço dos elytros. Na parte humeral os elytros são um pouco mais largos que o pronoto, mas alargam-se mais para o meio, depois decrescem em direcção aos apices. que são isoladamente arredondados. Cada elytro apresenta quatro costellas espessas; as duas internas são parallelas e convergem proximo ao apice em ponta recurva; a mais externa tem origem no humero, seguindo mais ou menos parallela á margem do elytro, onde termina em breve linha recurva, á altura da confluencia das internas; a seguinte nasce abaixo da região humeral, terminando além do ponto de confluencia das internas.

Processo mesosternal mais largo que o prosternal, a face central levemente convexa e triangular, os bordos lateraes levantados e cortados posteriormente em angulo recto, semelhantes aos bicos de um collarinho. Metasterno amplo, dividido na linha mediana por uma sutura longitudinal. Episternos metathoracicos largos, o bordo anterior e o externo quasi rectos, o interno levemente recurvo, depois fortemente estreitado distalmente, o bordo distal pequeno e truncado. A peça antecoxal dividida em quatro escleritos, os centraes quadrangulares, os lateraes longo-triangulares. Coxas posteriores largamente separadas.

Femures comprimidos lateralmente, levemente recurvos para dentro, muito esparsamente pontuados, inferiormente planos e levemente escavados, os bordos desta face inferior com pontuação mais grossa e munida de espinhos diminutos.

Tibias deanteiras mais curtas que os respectivos femures, com pontuação grossa munida de pequenos espinhos, alargadas distalmente, recurvas no apice, no canto interno do qual encontram-se dois espinhos fortes subeguaes em comprimento, o bordo apical diminutamente espinhoso. Tibias medias subeguaes aos respectivos femures, com os espinhos apicaes de comprimento desigual. Tibias posteriores mais longas que os respectivos femures, recurvas para cima e para dentro, os espinhos apicaes de comprimento desigual mas muito mais reforçados que os das tibias anteriores e médias.

Tarsos anteriores fortemente pontuados e densamente espinhosos nos bordos latero-inferiores, a pubescencia da sóla completa, o 1.º articulo do comprimento dos dois seguintes em conjuncto, 2-3 subeguaes, o 3.º bilobado, o apical subegual ao 1.º, as garras divaricadas, o paronychio desprovido de cerdas. Tarsos médios mais longos, o 1.º articulo mais longo que os dois seguintes em conjuncto, inferiormente canaliculado, desprovido de pubescencia, as bordas fortemente espinhosas, 2-3 subeguaes, 2 com pubescencia incompleta, 3 com pubescencia completa e bilobado, o apical do comprimento de 2-3 em conjuncto.

Tarsos posteriores quasi tão longos como as respectivas tibias, fortemente comprimidos, inferiormente canaliculados, os bordos espinhosos, com ausencia completa de pubescencia nas sólas, o 1.º articulo quasi tão longo como os restantes em conjuncto, o 2.º mais longo que o 3.º, este não bilobado, o apical subegual ao 2.º articulo.

Comprimento: — 20 mm.
Largura maxima: — 10.5 mm.

HOLOTYPO: — 1 femea, no Museu Paulista, sob o n.º 22.908.
LOCALIDADE DO TYPO: — Maracajú, Estado de Matto Grosso, III-1937. R. C. Shannon e J. Lane coll.

Esta especie é dedicada em homenagem ao Professor Lauro Travassos.

DISCUSSÃO TAXONOMICA: — O *Prionaplerus travassosi* sp. n. differe do *P. staphylinus* Guérin femea pelos elytros menos dehiscentes, mais quadrangulares que redondos nos humeros. as costellas elytraes muito mais grossas e salientes, as duas internas mais proximas e parallelas, o pronoto francamente tridentado nos bordos lateraes, etc. Do *P. woltersi* Bruch distingue-se perfeitamente por ser opaco, emquanto que a femea de *woltersi* é completamente lustrosa. O *P. breyeri* Bruch femea tem os elytros completamente unidos na sutura, o desenho elytral typico e os bordos do pronoto são apenas sinuosos e sublobulados.

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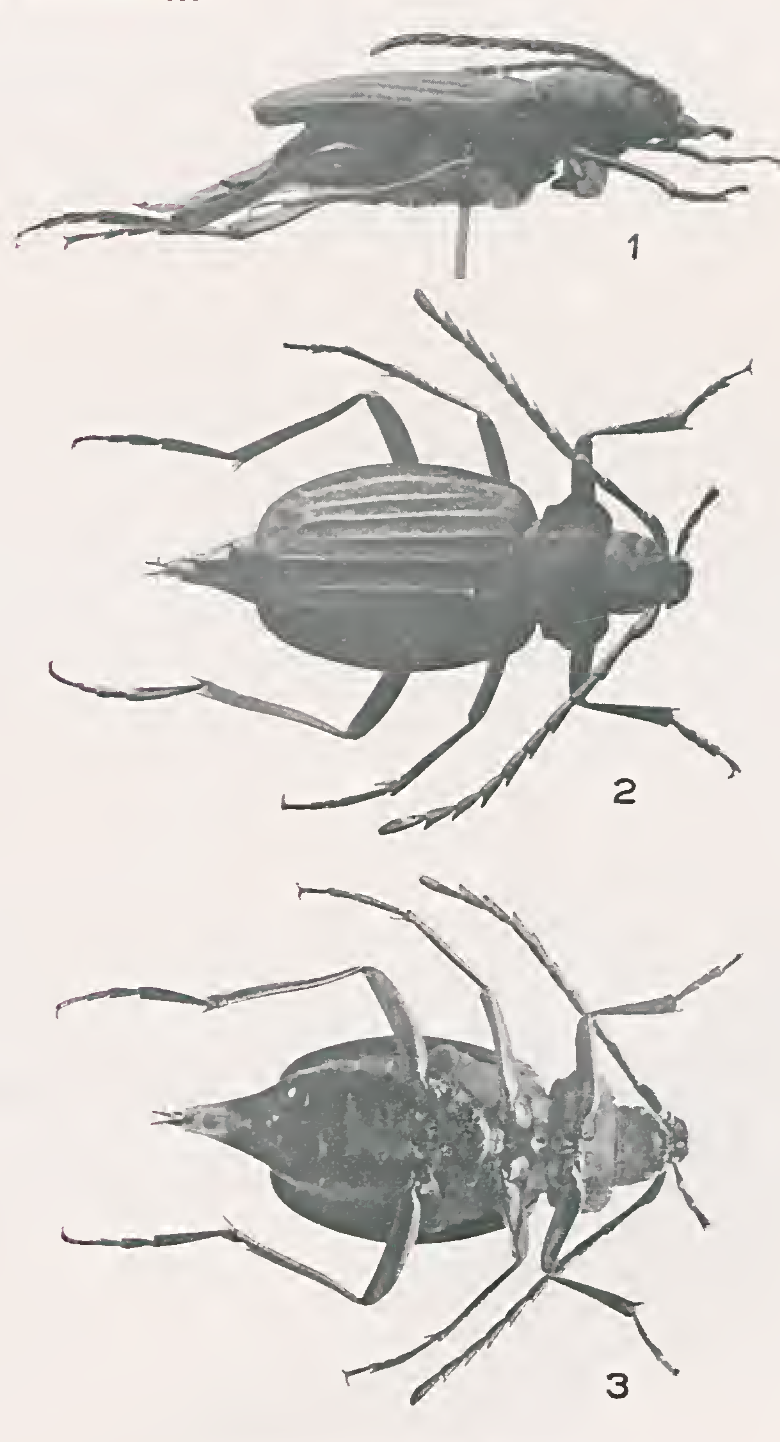
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Estampa 1

Fig. 1 — *Prionapterus travassosi* sp. n. Femea, vista lateral
Fig. 2 — *Prionapterus travassosi* sp. n. Femea, vista dorsal.
Fig. 3 — *Prionapterus travassosi* sp. n. Femea, vista ventral.



Lane: Especie nova do genero *Prionapterus*.

Tres novos Trichostrongylideos parasitos de roedores brasileiros

Herman Lent e **J. F. Teixeira de Freitas**
Instituto Oswaldo Cruz, Rio de Janeiro — Brasil

[Com 3 estampas]

Em homenagem ao prof. Lauro Travassos, á quem devemos nossa iniciação scientifica, publicamos este trabalho que consta do resultado de tres autopsias realisadas em ratos de bambú ou de taquara, *Kannabateomys amblyonyx* (Natterer), provenientes de Angra dos Reis, Estado do Rio, e de duas outras em rato rabudo, *Cercomys laurentius*, proveniente de Chique-Chique, Estado da Bahia.

No intestino delgado de *Kannabateomys amblyonyx* (Natterer) encontramos exemplares de *Longistriata nematodiriformis* (Travassos, 1918), referida até agora de *Proechimys cayennensis* Desm. (rato paca), e um trichostrongylideo para o qual creamos um novo genero, e que denominamos *Trichotravassosia travassosi* n. gen., n. sp.; do intestino grosso deste roedor descrevemos, tambem, uma nova especie de *Longistriata* — *L. travassosi* n. sp.

No intestino delgado de *Cercomys laurentius* encontramos uma especie que, provisoriamente, incluimos no genero *Heligmodendrium* Travassos, 1937

Longistriata travassosi n. sp.

(Est. 1, figs. 1-6).

Comprimento: — Machos 9,20 a 9,78 mm.; femeas 11,97 a 12,75 mm.
Largura: — Machos 0,237 a 0,302 mm.; femeas 0,263 a 0,302 mm.

Corpo com cuticula estriada transversalmente, com estrias longitudinaes sinuosas, com linhas longitudinaes salientes fortemente estriadas no sentido transversal, e, ainda, com uma aza lateral direita que mede 0,072 a 0,128 mm. nos machos e 0,112 a 0,128 mm. nas femeas. Extremidade anterior com dilatação cuticular separada do resto do corpo por um sulco e medindo 0,040 a 0,056 mm. de comprimento por 0,080 a 0,096 mm. de largura nos machos e 0,040 a 0,048 mm. por 0,080 a 0,096 mm. nas femeas. Bocca simples. Esophago claviforme com 0,42 a 0,45 mm. de comprimento por 0,056 a 0,064 mm. de largura nos machos e 0,46 a 0,48 mm. por 0,056 a 0,072 mm. nas femeas. Annel nervoso situado a 0,20 a 0,27 mm. da extremidade anterior nos machos e 0,24 a 0,30 mm. nas femeas. Póro excretor situado ao nivel do annel nervoso. Papillas cervicaes asymetricas, situadas em média a 0,21 a 0,27 mm. da extremidade cephalica nos machos e 0,25 a 0,30 mm. nas femeas, approximadamente ao nivel do annel nervoso, sendo que a papilla cervical direita, alojada na aza lateral, é mais desenvolvida e um pouco mais anterior. Intestino delgado mais ou menos rectilineo.

Femeas monodelphas, com vulva situada a 0,20 a 0,22 mm. da cauda. Ovejector com 0,21 a 0,32 mm. de comprimento. Utero com numerosos ovos de casca fina, tendo 0,065 a 0,070 mm. de comprimento por 0,032 a 0,043 mm. de largura. Tubo genital dirigido para diante, sendo que o ovario se curva em U, antes de attingir o fim do esophago, terminando logo depois. Anus situado a cerca de 0,13 mm. do apice caudal, que é afilado e obtuso. Extremidade posterior afilada, cercada por uma membrana cuticular, na qual se terminam as linhas longitudinaes da cuticula.

Machos com bolsa copuladora fracamente trilobada, levemente asymetrica, apresentando o lobo dorsal uma chanfradura mediana. Raios bursaes direitos levemente mais delgados que os do lado esquerdo. Papillas pre-bursaes presentes, sendo a do lado direito mais desenvolvida que a do esquerdo. Formula bursal: Raios ventraes nascem por tronco commum, do qual se separa logo o raio ventro-ventral que se torna divergente do ventro-lateral, dirigindo-se para diante e attingindo a margem bursal; raio ventro-lateral caminha para fóra, contiguo em grande parte do percurso ao lateral anterior e attinge a margem bursal; raios lateraes nascem por tronco commum, do qual se isola o lateral anterior, que é relativamente grosso e curto, em parte contiguo ao ventro-lateral, dirigido para fóra, não attingindo a margem da bolsa; raios lateraes médio e posterior com tronco commum, divergentes, dirigidos para traz e para fóra e attingindo a margem bursal; raios dorsaes com tronco commum; raios dorsaes externos nascem um pouco asymetricamente do dorsal, dirigem-se para traz e para fóra, não attingindo a margem da bolsa; raio dorsal bifurcado a cerca de 0,024 a 0,049 mm. da origem dos dorsaes externos em ramos que, a 0,065 a 0,094 mm. da bifurcação dorsal, se dividem em 2 pontas longas, das quaes as externas são levemente mais desenvolvidas. Espiculos amarellados, com 0,672 a 0,720 mm. de comprimento por 0,005 a 0,008 mm. de largura média, reunidos por uma aza membranosa interna estriada transversalmente, e apresentando a extremidade proximal levemente dilatada e a distal dividida em 2 pontas, das quaes as internas são menores e medem cerca de 0,008 mm. de comprimento, e as externas, maiores, curvas, medem cerca de 0,032 mm. de comprimento. Cone genital desenvolvido, saliente, approximadamente com 0,101 a 0,120 mm. de comprimento. Gubernaculo ausente. Telamon não evidenciado.

HABITAT: — Intestino grosso de *Kannabateomys amblyonyx* (Natterer).
PROVENIENCIA: — Angra dos Reis, Estado do Rio — Brasil.
Typos e cotypos na collecção helminthologica do Instituto Oswaldo Cruz.

Esta especie póde ser facilmente distinguida das outras descriptas no genero principalmente pela contiguidade existente entre os raios ventro-lateral e lateral-anterior. Bem caracteristica é, tambem, a divisão da extremidade distal dos espiculos.

É interessante assignalar a presença de um trichostrongylideo no grosso intestino, localisação bem pouco frequente no grupo; alguns exemplares foram colhidos no recto (2 autopsias).

Trichotravassosia n. gen.

Viannaiinae. Corpo com linhas longitudinaes salientes e interrompidas, de modo a individualisar verdadeiras escamas, bastante nitidas. Extremidade an-

terior com dilatação cuticular. Bocca simples. Esophago claviforme. Femeas monodelphas, com vulva situada perto do anus. Tubo genital dirigido para diante. Ovos de casca delgada. Cauda afilada e conica. Machos com bolsa copuladora levemente asymmetrica, sem lobo dorsal individualisado. Papillas pre-bursaes não evidenciadas. Formula bursal: Raios ventraes com curto tronco commum e divergentes; raio ventro-ventral nasce da base do ventro-lateral, delle divergindo logo; raio ventro-lateral maior que o ventro-ventral, dirigido para diante, determinando uma saliencia no contorno bursal; raios lateraes com tronco commum, do qual se separa em primeiro lugar o lateral-posterior; raios lateraes anterior e médio com tronco commum, profundamente divergentes; raios dorsaes com tronco commum; raios dorsaes-externos delgados, nascendo um pouco asymmetricamente do dorsal; raio dorsal bifurcado em ramos de pontas bifidas. Espiculos finos, com aza lateral interna estriada transversalmente. Gubernaculo não evidenciado. Telamon presente.

HABITAT: — Intestino delgado de roedores.
ESPECIE TYPO: — *Trichotravassosia travassosi* n. sp.

Trichotravassosia travassosi n. sp.
(Est. 2, figs. 1-6).

Comprimento: — Machos 3,94 a 4,60 mm.; femeas 3,94 a 4,73 mm.
Largura: — Machos 0,079 a 0,092 mm.; femeas 0,079 a 0,105 mm.

Corpo com cuticula provida de linhas longitudinaes salientes e interrompidas, individualisando escamas bastante nitidas, que são estriadas transversalmente e se iniciam abaixo do fim do esophago e terminam a uma certa distancia do fim do corpo. Na região esophageana e na extremidade posterior do corpo existem sómente as linhas longitudinaes salientes. Extremidade anterior com dilatação cuticular cephalica medindo 0,048 a 0,052 mm. de comprimento por 0,032 mm. de largura nos machos e 0,048 a 0,056 mm. por 0,032 a 0,036 mm. nas femeas. Bocca simples. Esophago claviforme, com 0,31 a 0,33 mm. de comprimento por 0,027 mm. de largura nos machos e 0,30 a 0,32 mm. por 0,027 mm. nas femeas. Annel nervoso situado a 0,21 a 0,22 mm. da extremidade anterior nos machos e 0,20 a 0,22 mm. nas femeas. Póro excretor e papillas cervicaes não evidenciados. Intestino mais ou menos rectilineo.

Femeas monodelphas, com vulva situada a 0,17 a 0,21 mm. da ponta da cauda. Ovejector com cerca de 0,13 a 0,20 mm. de comprimento. Utero com ovos de casca delgada, medindo 0,070 a 0,073 mm. de comprimento por 0,030 a 0,032 mm. de largura. Tubo genital dirigido para diante. Extremidade posterior afilada e conica, com anus situado a 0,088 a 0,096 mm. de seu apice. Não existe dilatação cuticular globosa envolvendo a cauda, porém a cuticula, no trecho comprehendido entre a vulva e o anus, se dilata levemente. Intestino terminado por um recto que mede 0,035 a 0,040 mm. de comprimento.

Machos com bolsa copuladora levemente asymetrica. Papillas pre-bursaes não evidenciadas. Formula bursal: Raios ventraes nascem por curto tronco commum e são divergentes, raio ventro-ventral nasce da base do ventro-lateral, delle divergindo logo, dirigindo-se para diante e para dentro e attingindo a margem bursal; raio ventro-lateral maior que o ventro-ventral, dirige-se para

diante e attinge a margem bursal, onde determina uma saliencia aguda; raios lateraes com grande tronco commum do qual se isola em primeiro lugar o lateral-posterior; raios lateraes anterior e médio com tronco commum, profundamente divergentes; o raio lateral-anterior dirige-se para diante e para fóra, attingindo a margem da bolsa; o raio lateral-médio dirige-se para fóra e para traz, curvando-se distalmente para dentro, não attingindo a margem bursal; raio lateral-posterior nasce do tronco commum aos lateraes anterior e médio, dirige-se para traz e para fóra, attingindo a margem da bolsa; raios dorsaes com tronco commum; raios dorsaes-externos delgados, nascem do dorsal, um pouco asymetricamente, dirigem-se para fóra e para traz, apresentando-se sinuosos em sua porção distal; raio dorsal bifurcado a 0,027 a 0,038 mm. da origem dos dorsaes-externos em ramos bastante divergentes, que a 0,051 a 0,059 mm. da bifurcação dorsal se dividem em 2 pontas, das quaes as externas são mais longas e dirigidas para diante em sua porção distal. Espiculos amarellados, com 0,116 a 0,118 mm. de comprimento por 0,005 mm. de largura média, tendo a base levemente dilatada e a ponta aguda, e possuindo uma aza lateral interna estriada transversalmente. Gubernaculo não evidenciado. Telamon presente, ovoide, com cerca de 0,051 a 0,051 mm. de comprimento por 0,024 a 0,027 mm. de largura.

HABITAT: — Intestino delgado de *Kannabateomys amblyonyx* (Natterer).
PROVENIENCIA: — Angra dos Reis, Estado do Rio — Brasil.
Typos e cotypos na collecção helminthologica do Instituto Oswaldo Cruz.

Este genero que agora estabelecemos se approxima de *Acanthostrongylus* Travassos, 1937, do qual se distingue pela formula bursal e, principalmente, pelo aspecto do tronco dorsal; de *Longistriata* Schulz, 1926, se distingue pelas formações cuticulares escamiformes, que lhe dão aspecto bastante peculiar, embora delle se approxime pela disposição dos raios bursaes.

Heligmodendrium interrogans n. sp.

(Est. 3, figs. 1-7).

Comprimento: — Machos 3,55 a 3,91 mm.; femeas 4,47 a 6,49 mm.
Largura: — Machos 0,092 a 0,105 mm.; femeas 0,092 a 0,118 mm.

Corpo com cuticula provida de linhas e cristas longitudinaes, lateraes e ventraes, ás vezes bosseladas. As linhas longitudinaes dorsaes se individualisam em escamas pouco pronunciadas, que se tornam evidentes desde a extremidade cephalica e são, assim como as cristas, fortemente estriadas no sentido transversal. Extremidade anterior com dilatação cuticular cephalica, medindo 0,036 a 0,040 mm. de comprimento por 0,040 mm. de largura nos machos e 0,040 a 0,048 mm. por 0,032 a 0,040 mm. nas femeas. Bocca simples. Esophago claviforme com 0,27 a 0,32 mm. de comprimento por 0,022 a 0,024 mm. de largura nos machos e 0,36 a 0,40 mm. por 0,027 mm. nas femeas. Annel nervoso situado a 0,21 mm. da extremidade anterior nos machos e 0,27 a 0,28 mm. nas femeas. Póro excretor mais ou menos ao nivel do annel nervoso, a 0,25 mm. da extremidade anterior nos machos e 0,29 a 0,30 mm. nas femeas. Papillas cervicaes não evidenciadas. Intestino mais ou menos rectilineo.

Femeas monodelphas, com vulva de labios salientes, situada a 0,22 a 0,35 mm. da ponta da cauda. Ovejector com 0,16 a 0,18 mm. de comprimento. Utero com ovos de casca fina, medindo 0,067 a 0,081 mm. de comprimento por 0,035 a 0,050 mm. de largura. Tubo genital dirigido para diante. Extremidade posterior afilada, com anus situado a 0,081 a 0,101 mm. do apice caudal, que é arredondado, possuindo 3 leves saliencias, das quaes a mediana é mais desenvolvida. A cuticula da extremidade posterior se apresenta um pouco dilatada.

Machos com bolsa copuladora trilobada, levemente asymetrica. Papillas prebursaes não evidenciadas. Formula bursal: Raios ventraes divergentes, com curto tronco commum; raio ventro-ventral dirige-se para diante e para dentro, quasi attingindo a margem bursal; raio ventro-lateral maior que o ventro-ventral, dirigido para diante e attingindo a margem bursal, onde determina uma saliencia aguda; raios lateraes com tronco commum, do qual se isola em primeiro lugar o lateral-posterior; raios lateraes anterior e médio contiguos em parte do percurso e depois divergentes; o lateral-anterior dirige-se para diante e para fóra, o lateral-médio dirige-se para traz e para fóra, ambos attingindo a margem da bolsa; raio lateral-posterior com tronco commum ao lateral-médio, divergente deste, dirigindo-se para traz e para dentro, attingindo a margem bursal; raios dorsaes com tronco commum; raios dorsaes externos nascem da base do dorsal, dirigem-se para traz e quasi attingem a margem da bolsa; raio dorsal bifurcado a 0,013 a 0,016 mm. da origem dos dorsaes-externos em ramos que a 0,054 a 0,059 mm. da bifurcação dorsal se dividem em 2 pontas, das quaes as externas, com o apice curvado para dentro, quasi attingem a margem da bolsa, e as internas, apresentando no meio uma pequena saliencia externa, attingem a margem bursal. Espiculos amarellados, com 0,100 a 0,148 mm. de comprimento por 0,004 a 0,005 mm. de largura média, apresentando a base levemente mais larga e a ponta afilada e simples, sendo reunidos por uma aza membranosa interna estriada transversalmente. Gubernaculo não evidenciado. Telamon bem desenvolvido, com 0,030 a 0,040 mm. de comprimento e possuindo 2 prolongamentos lateraes agudos e desiguaes.

HABITAT: — Intestino delgado de *Cercomys laurentius*.
PROVENIENCIA: — Chique-Chique, Estado da Bahia — Brasil.
Typos e cotypos na collecção helminthologica do Instituto Oswaldo Cruz.

Incluimos esta especie no genero *Heligmodendrium*, em caracter provisorio, porquanto seu tronco dorsal a afasta bastante das demais.

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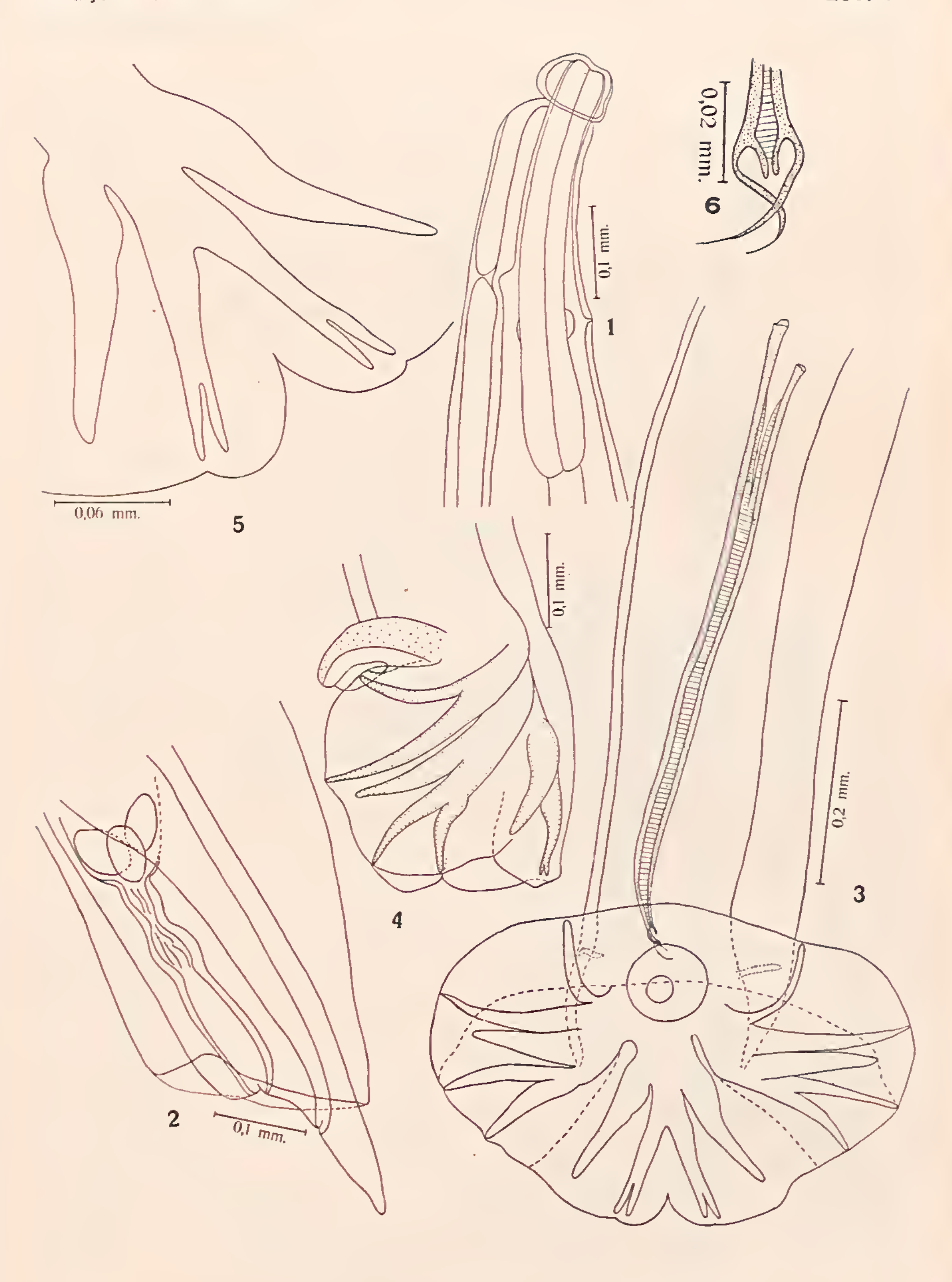
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Estampa 1

Longistriata travassosi n. sp.

Fig. 1 — Extremidade anterior.
Fig. 2 — Extremidade posterior da femea.
Fig. 3 — Extremidade posterior do macho.
Fig. 4 — Bolsa copuladora de perfil.
Fig. 5 — Raios dorsaes da bolsa copuladora.
Fig. 6 — Extremidade distal dos espiculos.

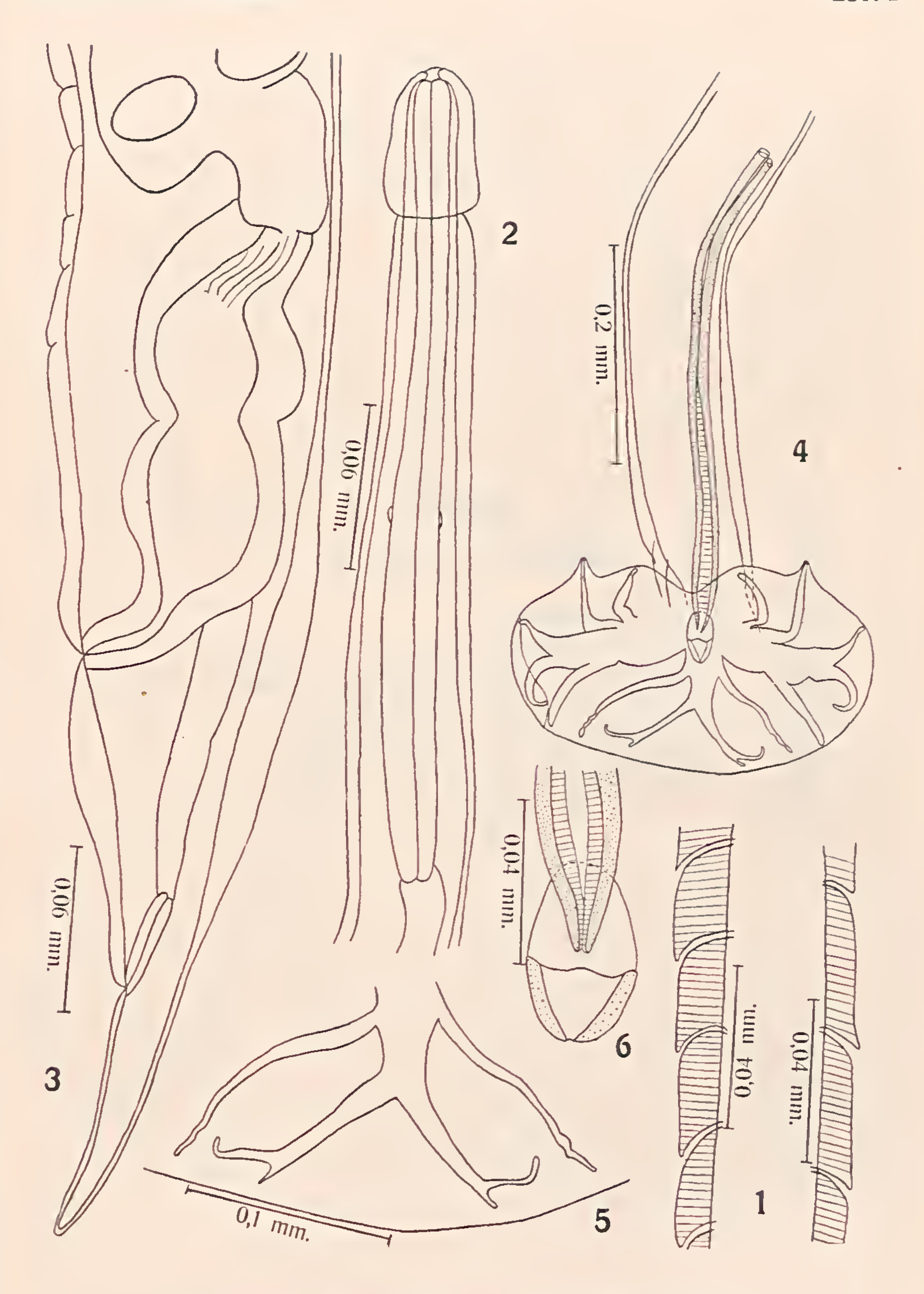


Lent & Freitas: Trichostrongylideos de roedores brasileiros.

Estampa 2

Trichotravassosia travassosi n. sp.

Fig. 1 — Escamas cuticulares.
Fig. 2 — Extremidade anterior.
Fig. 3 — Extremidade posterior da femea.
Fig. 4 — Extremidade posterior do macho.
Fig. 5 — Raios dorsaes da bolsa copuladora.
Fig. 6 — Extremidade distal dos espiculos e telamon.

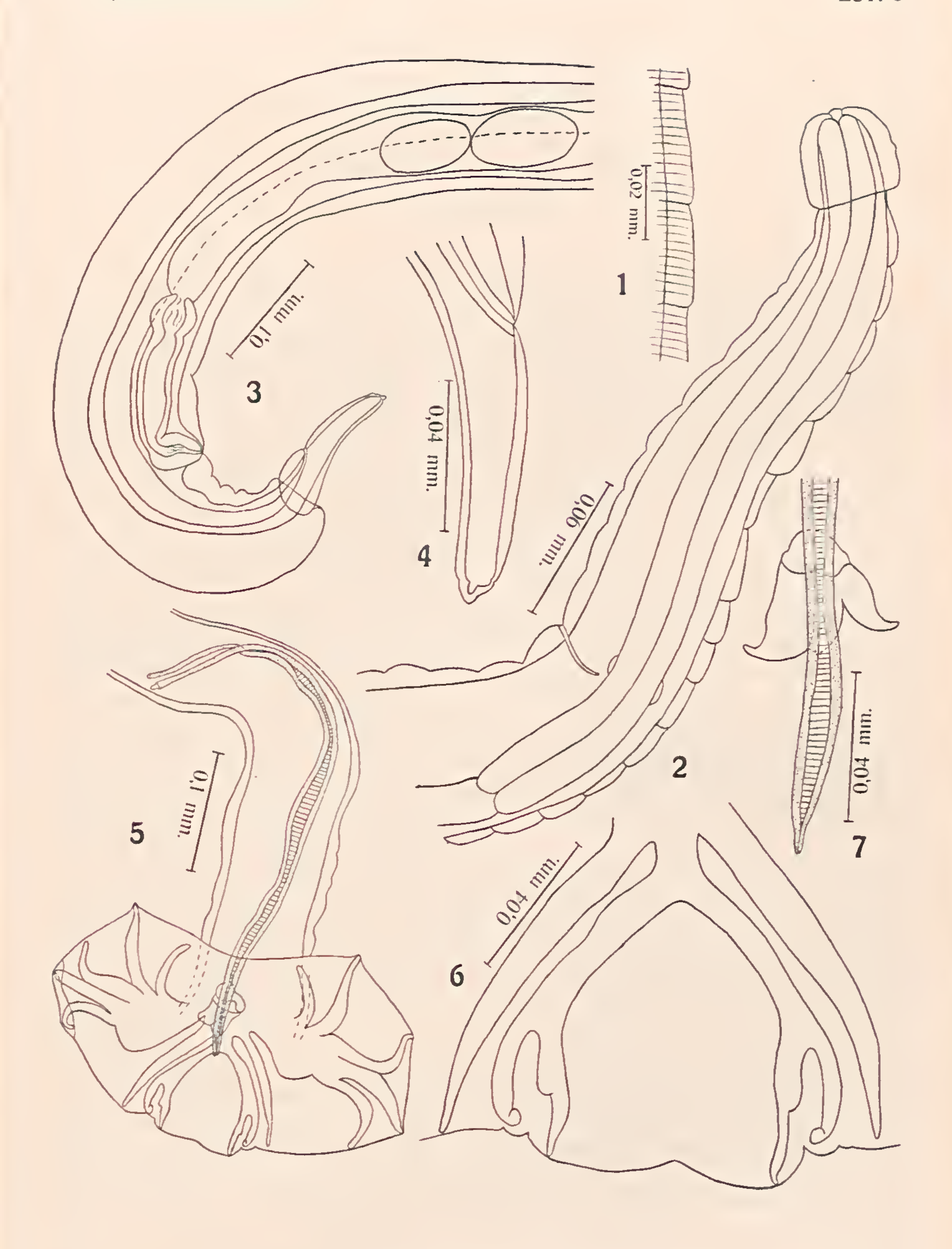


Lent & Freitas: Trichostrongylideos de roedores brasileiros.

Estampa 3

Heligmodendrium interrogans n. sp.

Fig. 1 — Linhas longitudinaes.
Fig. 2 — Extremidade anterior.
Fig. 3 — Extremidade posterior da femea.
Fig. 4 — Detalhe da extremidade posterior da femea.
Fig. 5 — Extremidade posterior do macho.
Fig. 6 — Raios dorsaes da bolsa copuladora.
Fig. 7 — Extremidade distal dos espiculos e telamon.



Lent & Freitas: Trichostrongylideos de roedores brasileiros.

Cestode hold-fasts

Edwin Linton, Ph. D.
University of Pennsylvania — U. S. A.

[With 2 plates]

When a sexually mature joint (proglottis) of a cestode worm, an adult monogenetic trematode, and a free-living turbellarian are compared, one with another, sufficient resemblances will be noted to warrant the conclusion that the parasitic forms have descended from free-living forms. The cestodes, however, have become so completely adapted to a habitat within other animals that their developmental history is buried in a past of such vast duration that no possibility promises of bridging the gap which separates existing from extinct forms, especially since fossil forms are not in evidence.

Of course it is quite possible that chitinous hooks of cestodes may some time be recognized in thin sections of cropolites, even so, but little light would be shed on the developmental history of the cestodes.

As a rule, when nature adapts an organism to new environmental conditions, or to new relations to old surroundings, the necessary organs are fashioned from structures which are already present. Thus the paired fins of fishes, the flippers of porpoises, the legs and wings of bats and birds, the legs of quadrupeds and the limbs of primates are all modifications of the same fundamental structures in the ancestor of all vertebrate animals.

In the case of the monogenetic trematode, the departure from the turbellarian type necessary to fit it for the life of an ecto-parasite is not so great but that it can be seen to be in a measure an intermediate step between the turbellarian and the cestode. Furthermore, the parallelism between a typical digenetic trematode and the proglottis of a cestode is sufficiently close to indicate a common ancestry.

It is customary to regard the scolex of the cestode worm as the anterior end. Some, however, do not so regard it. Thus Kofoid holds that in the Cestodaria, the rosette, which is plainly at the posterior end, but by which the worm attaches itself to its host, corresponds to the scolex of the cestoda. If this conception is true then the strobile of the cestode might be compared with the strobile of the jelly-fish, *Aurelia*, the scolex of the cestode thus being the morphological, as it is the functional equivalent of the rhizoid portion of the hydra-tuba.

Whatever the true interpretation may be, we have in the scolex of cestodes a portion which has nothing corresponding with it in free-living flatworms. A consideration of the hold-fast organs of cestode worms is of interest, therefore, since these structures have arisen subsequent to the adoption of a parasitic mode of life.

Although in almost all cestodes there is a scolex present which bears some sort of means of fixation, it is inconspicuous in some, as in *Ligula* and

Spathebothrium. The principal organs of fixation, technically called bothria, are, in the great majority of cases, four in number. In all cases the scolex is symmetrical. This is to be expected, since in the habitat of the cestode, whether in the intermediate or the final host, there is nothing to call for right or left, dorsal or ventral. While it is true that a dorsal and ventral, and therefore a right and left, symmetry is recognized in the strobile, it is somewhat arbitrarily chosen, and often requires the examination of sections to determine. At best this dorsality and ventrality is little more than a hint of a far-off ancestry that lived in the open. They are characters which have no significance in the reactions of the cestode to its immediate surroundings.

In the evolution of the cestodes from a free-living flat-worm ancestry, it is to be noted that in the proglottides, the differentiations that have arisen have been modifications of structures already present in the ancestral line. While there are numberless differences in proportions and relative positions of the various structures, nothing new appears; ovaries, testes, yolk glands, the complicated machinery concerned in the making and fertilization of the egg, the recurrence of the introvert mechanism in the copulatory cirrus, all varying in kaleidoscopic fashion, and accounting for a long list of species and genera, yet all of this congeries of forms are but modifications of a plan that was laid down in the free-living ancestry from which they are descended.

When we come to consider the hold-fast organs of the cestodes, however, we find a different state of affairs. In adapting themselves to the habits and habitats of entozoa, the free-living flat-worms did not possess organs that could be transformed, or moulded, into structures for fixation. Then emerged various hold-fasts in the shape of suckers of diverse patterns, many of them provided with chitinous hooks of a great variety of numbers, form, and arrangement, but specifically distinct.

In the scolex of the cestodes, then, we recognize something arising that is not a modification of a structure that was present in the free-living ancestry. One is reminded of the changes incident to the evolution of the cetaceans from land mammals which adopted an aquatic habitat. The paddles, and even the flukes can be accounted for as modifications of structures characteristic of the quadruped ancestors. But what shall we say of the dorsal fin, which is present in the porpoises and in some of the whales? No land mammal possessed a structure which could be moulded into a dorsal fin. It would seem that the dorsal fin of porpoises and the hold-fast organs of the cestodes appeared, in some fashion, in response to the surroundings.

Perhaps the necessary genes, or combinations of genes, were evoked by surrounding conditions. Plainly Chevalier Lamarck's evolutionary concepts are at least suggested by such emergences as the dorsal fin of the porpoise and the hold-fasts of the cestodes.

There is, however, a great difference in the subsequent history of dorsal fin and hold-fast, once they have appeared. The dorsal fin remains of the same form, differing only, and that but slightly, in its proportions. The hold-fast, on the other hand, differentiates into many and diverse forms.

A few, out of the hundreds of types of scolex that have been described, will be sufficient to show that the same evolutionary processes, which produce varieties and species in animals that lead a free existence, are evidenced by

the diversity of organs of adhesion in animals which have adopted a habitat within other animals.

A comparatively simple scolex, provided with two bothria, as in the broad tapeworm of man, is shown in Pl. 1, fig. 1. This, however, is the scolex of a tapeworm *(Dibothrium microcephalum)* from the pelagic sunfish *Mola mola*. The scolex with four prominent, unarmed bothria (Pl. 1, fig. 2) is that of a tapeworm *(Anthobothrium laciniatum)* from a shark, *Carcharias obscurus*.

Another selachian cestode *(Rhinebothrium cancellatum)* is shown in Pl. 1, fig. 3. The four bothria are unarmed, but each is provided with a number of loculi. This cestode is from the ray, *Rhinoptera quadriloba*.

In Pl. 1, fig. 4, the scolex of a tapeworm *(Acanthobothrium paulum)* from the sting ray, each of the four bothria is loculate, and is provided with a pair of two-tined hooks. Moreover, at the anterior end of each bothrium there is an auxiliary sucker.

The scolex of another tapeworm *(Tylocephalum pingue)* from the ray *Rhinoptera quadriloba*, is shown in Pl. 1, fig. 5. In this scolex four suckers are present, somewhat as in *Taenia*. The scolex, however, terminates in a relatively large muscular proboscis.

The scolex of another tapeworm *(Discocephalum pileatum)* shown in Pl. 1, fig. 7, penetrates the mucous membrane of the spiral valve of its host, *Charcarias obscurus*, where it spreads out, acting like a mushroom-anchor. These cestodes are usually so firmly attached that, in order to collect them intact, it is necessary to dissect away the surrounding tissues. A holdfast of somewhat similar action is shown in Pl. 1, fig. 6.

A diagrammatic sketch of the scolex and pseudo-scolex of a tapeworm *(Thysanocephalum thysanocephalum)* from the leopard shark is shown in Pl. 1, fig. 8. The sketch is that of a young specimen. The inconspicuous scolex does not increase in size with the growth of the strobile, which may attain a length of a meter or more. The pseudoscolex, when not attached to the mucous membrane of its host, contracts into a mop-like mass, which, in an adult strobile, may yet be 30 or more times the diameter of the scolex. In living specimens attached to the mucous membrane of the spiral valve it may have a diameter of 25 millimeters or more.

In Pl. 1, figs. 11 to 15 are shown hooks of selachian cestodes which exhibit similarities and differences suggestive of orthogenesis.

But the most highly differentiated type of cestode hold-fast is seen in the introverts, or proboscides, of the *Tetrarhynchidae*. Pl. 2, fig. 1 is a diagrammatic sketch of a tetrarhynch seen in longitudinal section. These structures, of which there are four in each scolex, are presumably homologues of the suckers, or bothria, of *Taenia*. The hooks of these eversible proboscides occur in a great variety of patterns, shapes, sizes and numbers, and furnish easily recognizable specific characters.

Incidentally it may be remarked that the resemblance of the mechanism of the introvert hold-fast of the *Tetrarhynchidae* to that of the *Acanthocephala* is not to be dismissed as a case of parallel evolution, since there exist other reasons than similarity of hold-fast organs for regarding the *Acanthocephala* as related to the *Cestoda*.

A few examples of tetrarhynch proboscides are given in Pl. 2, figs. 2-5.

In Pl. 2, figs. 6 and 7 a peculiar cestode form is shown, from the sting

ray, in which the taenia-like scolex, instead of a rostellum of hooks, has developed a fascicle of tentacle-like, eversible organs.

A remarkable pseudo-scolex is that which appears in the genus *Fimbraria*, Here the anterior region of the strobile is transformed into a broad and thin pennant-like structure, widest posteriorly and tapering to the anterior end, which terminates in a minute scolex, provided with four bothria and a rostellum armed with a circle of hooks, a type of scolex characteristic of many species of avian cestodes. See Pl. 2, figs. 8 and 9.

Attention may be called here to the fact that the hold-fasts of cestodes in some instances have other functions in addition to that of fixation. Thus, some with mobile bothria, as *Anthobothrium*. Pl. 1, fig. 4, may act as organs of locomotion. Likewise the broadly-expanded surface exposed by the bothria of such genera as *Phyllobothrium* and *Rhinebothrium*, and the pseudo-scolex of *Thysanocephalum*, and, perhaps, of *Fimbraria*, point to parts played in the metabolism of the worm, in the way of absorption of nutriment and elimination of waste products.

Only a few examples out of the vast number of known kinds of cestode hold-fast organs have been given in this brief account. Enough cases have been cited, however, to give some idea of the evolutionary diversities which have followed upon the adoption of the parasitic mode of life.

Plate 1

Fig. 1 — *Dibothrium microcephalum*, from *Mola mola*. Length of bothrium about 1.5 mm. Bulletin U. S. Fish Commission for 1899.

Fig. 2 — *Anthobothrium laciniatum*, from *Carcharias obscurus*. Diameter of scolex about 1 mm. Report U. S. Fish Commission for 1887.

Fig. 3 — *Rhinebothrium cancellatum*, from *Rhinoptera quadriloba*. Length of bothrium 0.7 mm. Report U. S. Fish Commission for 1887.

Fig. 4 — *Acanthobothrium paulum*, from *Dasybatis centrura*. Length of bothrium 0.75 mm. Report U. S. Fish Commission for 1887.

Fig. 5 — *Tylocephalum pingue*, from *Rhinoptera quadriloba*. Length of scolex 1 mm. Report U. S. Fish Commission for 1887.

Fig. 6 — *Lecanicephalum peltatum*, from *Dasybatis centrura*. Diameter of scolex 0.8 mm. Report U. S. Fish Commission for 1887.

Fig. 7 — *Discocephalum pileatum*, from *Carcharias obscurus*. Diameter of scolex 4 mm. Report U. S. Fish Commission for 1887.

Fig. 8 — *Thysanocephalum thysanocephalum*, from *Galeocerdo tigrinus*. Length of bothrium 0.5 mm. Report U. S. Fish Commission for 1888.

Fig. 9 — Bothrium of same, from life. Length about 4 mm. Report U. S. Fish Commission for 1888.

Fig. 10 — Same, from alcoholic specimen. Report U. S. Fish Commission for 1888.

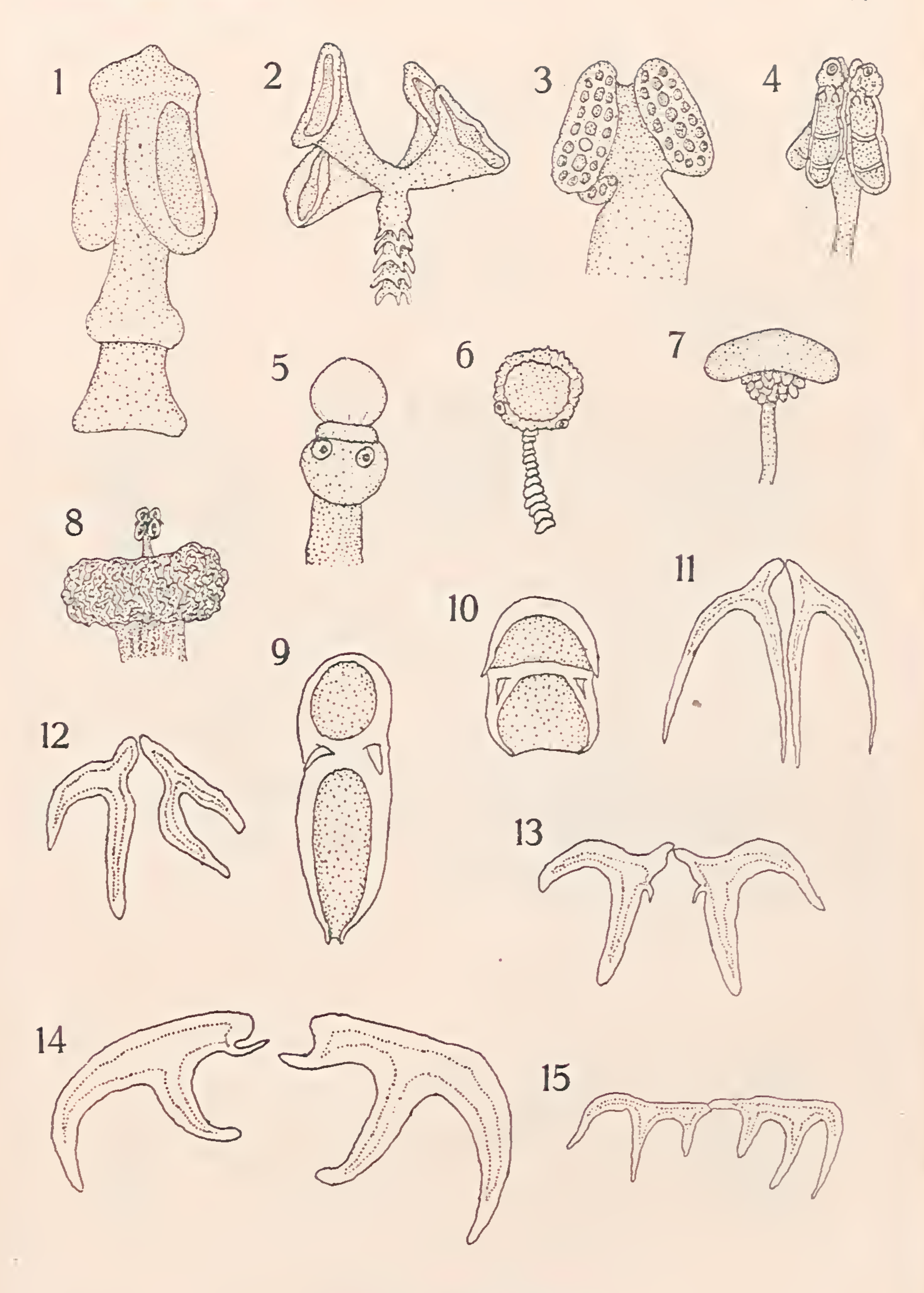
Fig. 11 — *Acanthobothrium paulum*, from *Raja eglanteria*. Pair of hooks, length 0.14 mm. Proc. U. S. Nat. Mus., vol. 64.

Fig. 12 — *Acanthobothrium coronatum*, from *Raja laevis*. Pair of hooks, length 0,11 mm. Proc. U. S. Nat. Mus., vol. 64.

Fig. 13 — *Phoreiobothrium exceptum*, from *Sphyrna zygaena*. Pair of hooks, length 0.13 mm. Proc. U. S. Nat. Mus., vol. 64.

Fig. 14 — *Phoreiobothrium triloculatum*, from *Carcharias obscurus*. Pair of hooks, length 0.15 mm. Proc. U. S. Nat. Mus., vol. 64.

Fig. 15 — *Phoreiobothrium lasium*, from *Carcharias limbatus*. Pair of hooks, length 0.10 mm. Proc. U. S. Nat. Mus., vol. 64.



Linton: Cestode hold-fasts.

Plate 2

Fig. 1 — Longitudinal section of tetrarhynch proboscis, diagrammatic; *mb.* muscular bulb; *r.* retractor muscle.

Fig. 2 — *Tetrarhynchus erinaceus*, from cyst in *Pomotomus saltatrix*. Portion of proboscis, diameter, exclusive of hooks, 0.1 mm. Proc. U. S. Nat. Mus., vol. 19.

Fig. 3 — *Synbothrium filicolle*. from cyst in *Dasybatis centrura*. Median region of proboscis, length of hook 0.06 mm. Proc. U. S. Nat Mus, vol. 19.

Fig. 4 — *Rhinchobothrium insigne*, from *Carcharias milberti*. Near base of proboscis, diameter 0.3 mm. Proc. U. S. Nat. Mus., vol. 61.

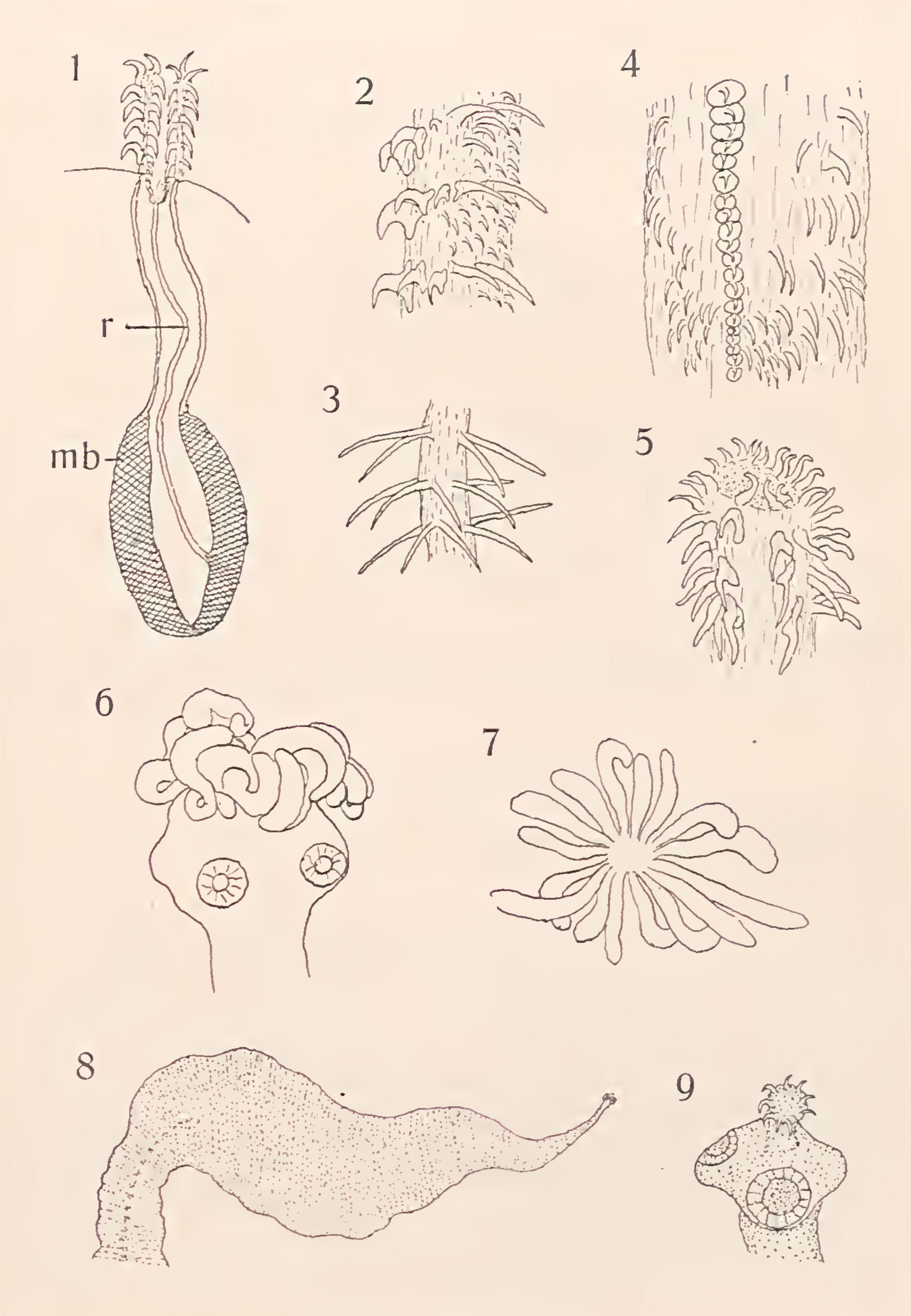
Fig 5 — Same. Tip of proboscis, diameter, exclusive of hooks, 0.16 mm. Proc. U. S. Nat Mus., vol. 61.

Fig. 6 — *Parataenia medusia*, from *Dasybatis centrura*. Diameter of scolex 0.5 mm. Report U. S. Fish Commission for, 1887.

Fig. 7 — Same. Front view of rosette of extruded tentacular proboscides. Sketched from an alcoholic specimen. Report U. S. Fish Commission for 1887.

Fig. 8 — *Fimbraria falciformis*, from *Clangula hyemalis*. Scolex and pseudoscolex. Proc. U. S. Nat. Mus., vol. 70.

Fig. 9 — Same. Diameter of scolex 0.12 mm. Proc. U. S. Nat. Mus., vol. 70.



Linton : Cestode hold-fasts.

Sobre quatro novas especies de Sarcophagideos do Brasil

(Dipt.)

H. de Souza Lopes
Instituto Oswaldo Cruz, Rio de Janeiro — Brasil

[Com 2 estampas]

No presente trabalho descrevo uma nova especie do genero *Nephochaetopteryx* Towns. e tres do genero *Sarcophaga* Meigen.

GENERO *NEPHOCHAETOPTERYX* TOWNSEND, 1934.

Nephochaetopteryx Townsend, 1934. Rev. Ent., vol. 4, p. 203; Lopes, 1936, Arch. Inst. Biol. Veget., vol. 3, n.º 1, p. 82.

Deste genero se conhecem 7 especies, sendo que, além das 6 assignaladas em 1936, verifiquei que *Bercaea subaurata* Engel, 1931 (Konowia, vol. 10, p. 142, figs. 8 e 8 a) proveniente de San José (Norte da Argentina), pertence a este genero.

Nephochaetopteryx travassosi n. sp.
(Est. 1, figs. 1 e 4).

Differe das demais especies do genero pela constituição da genitalia do macho.

Macho: — Comprimento total 7 mm.

Cabeça amarello-dourada, vitta frontal preta e opaca com excepção da parte anterior onde é fracamente avermelhada, clypeo cinzento e facialia muito escura, quasi preta. Fronte com cerca de 0,26 da largura da cabeça. Vitta frontal com cerca de 0,48 da largura da fronte ao nivel da cerda frontal superior. Ha 6 cerdas frontaes sendo a ultima implantada no nivel do terço basal do segundo articulo antennal. Antennas escuras, segundo segmento quasi preto, medindo cerca de 0.27 do comprimento do terceiro. Antennas attingindo cerca de 0,94 da distancia entre a base e a margem oral. Arista plumosa nos 2/3 basaes, de coloração castanha com uma parte mediana amarella. Cerdas ocellares bem desenvolvidas, vertical externa cerca da metade do comprimento da vertical interna. Ha 2 cerdas proclinadas na fronte sendo a mais anteriormente situada muito mais desenvolvida que a outra. Vibrissas exactamente ao nivel da margem oral, ha sómente umas poucas cerdas acima das vibrissas, na facialia. Parafacialia com 2 ou 3 pêlos na parte inferior na mar-

gem ocular, medindo cerca de 0,33 da distancia entre as vibrissas. Parte posterior da cabeça com cerdas pretas, havendo alguns pêlos claros abaixo do pescoço; ha duas series de cerdas postoculares sendo a mais inferior muito irregular. Tromba preta, palpos castanho-amarellados.

Thorax: Mesonotum e pleuras intensamente dourados sendo cinzenta a parte inferior da sternopleura. A faixa longitudinal mediana do mesonotum é muito preta (como, aliás, tambem as outras faixas) e estreitada, mede cerca de um terço da largura das demais, e se alarga no escutello. As 2 faixas lateraes são anteriormente muito estreitas numa extensão muito curta e depois se alargam bruscamente, ao nivel das cerdas posthumeraes. Ha ainda uma faixa preta que occupa a região das cerdas supralares postsuturaes e outra na parte inferior da notopleura. Cerdas acrostichaes e prescutellar ausentes; 2 dorsocentraes postsuturaes longas acompanhadas de 2 outras muito menores; 2 ou 3 dorsocentraes presuturaes pequenas; 3 humeraes, 1 posthumeral; 3 supralares; 2 intralares; 2 notopleuraes, 2 lateraes no escutello, um par reduzido preapical; apicaes ausentes; ha 3 esternopleuraes e cerca de 5 na serie de hypopleuraes. A propleura é núa como o proesterno.

Abdomen: segundo tergito preto dorsalmente com pollinosidade amarella do lado. Segmentos 3 a 5, quando vistos dorsalmente, com 3 triangulos pretos e brilhantes situados com a base para a parte posterior do tergito, sendo que o mediano attinge a parte anterior, o restante coberto de pollinosidade amarellada; vistos lateralmente, a parte preta occupa quasi todo o dorso do segmento; lateralmente o tergito é quasi que inteiramente coberto de pollen amarello. Primeiro segmento genital escurecido com a parte posterior amarellada, segundo segmento com o centro preto brilhante e com os lados amarellados. Os tergitos 2 a 4 teem cerdas em toda a margem, um pouco mais longas que as que cobrem os tergitos. O quinto tem uma serie de cerdas erectas. Os esternitos 2 e 3 são recobertos no centro de pêlos muito longos e claros, lateralmente teem pêlos curtos. O quarto tem pêlos curtos e pretos occupando uma faixa mediana longitudinal com cerca de 1/3 da largura do esclerito, tendo as partes lateraes sómente pêlinhos claros e esparsos. O quinto esternito tem uma fenda mediana pouco nitida e nas extremidades um tuberculo pouco accentuado. Forceps pretos e afinados para o apice. Penis volumoso, com o apice arredondado e varias formações na face anterior.

Patas muito pretas, a face externa do femur do primeiro par é nitidamente amarellada. Femur anterior com uma fileira de cerdas dorsal e outra ventral, havendo na parte superior da face anterior uma serie de cerdas menores; femur médio com duas cerdas no meio da face anterior, face posterior com 2 cerdas preapicaes; a face ventral junto ao bordo posterior tem apicalmente um ctenideo com 4 ou 5 fortes espinhos depois uma serie de 6 ou 7 cerdas de tamanhos diversos e, limitando o terço basal uma cerda muito longa que é maior do que a largura do femur; femur posterior com uma cerda preapical na face posterior e outra na face dorsal seguida de uma serie de cerdas espaçadas, face ventral com uma serie de cerdas sendo que a cerda mais proxima do apice é mais longa que a largura do femur. Tibia anterior com uma cerda na metade basal da face anterior e uma outra na metade apical da face posterior. A tibia média tem 3 cerdas na face posterior. Tibia posterior com 2 cerdas na face anterior, 2 na face posterior e uma na metade apical da face ventral.

Azas hyalinas, infuscadas no apice; r_1 com cerdas em toda a extensão;

r 4+5 com cerdas até um pouco depois da nervura transversa. Curvatura de m 1 pouco accentuada. Calypteros amarellados.

HOLOTYPO: — 1 macho da Gavea, Rio de Janeiro, 29. 7. 1937, H. S. Lopes leg. (dentro de casa).

Denomino esta especie em homenagem ao meu mestre Prof. L. Travassos.

Sarcophaga crispula n. sp.

(Est. 1, figs. 2, 3 e 6).

Esta especie differe das demais pela constituição da genitalia do macho e por apresentar o quinto esternito, no mesmo sexo, com uma formação mediana.

Macho: — Comprimento total 8 a 12 mm.

Face, fronte e orbitas postoculares douradas, sendo que a fronte tem tonalidade nitidamente mais fraca que a face; parte posterior da cabeça cinzenta com tonalidade dourada muito pouco visivel. Fronte com cerca de 0,22 da largura da cabeça. Vitta frontal preta, medindo 0,35 da largura da fronte. Cerdas ocellares reduzidas; verticaes externas ausentes, verticaes internas longas, sendo a região entre ellas nitidamente prateada. Frontalia e parafacialia com pequenos pêlos nas orbitas oculares. Ha 9 a 10 cerdas frontaes; as mais inferiormente situadas estão no nivel da metade do segundo segmento antennal, attingindo em alguns exemplares o terço apical. Antennas escuras, o segundo segmento nitidamente mais escuro que o terceiro; o segundo segmento mede cerca de 0,53 do comprimento do terceiro que attinge aos 0.8 da distancia desde a base das antennas ao nivel das vibrissas que se acham situadas logo acima da margem oral. Parafacialia com 0,13 da distancia entre as grandes vibrissas. Facialia com pêlos pequenos no terço inferior. Parte posterior da cabeça com 3 series de cerdas pretas, superiormente com cerdas claras e inferiormente com pêlos claros longos.

Thorax: Humero, mesopleura e metapleura fracamente amarellas. Ha 3 cerdas humeraes; 1 posthumeral; 3 supralares postsuturaes e 1 presutural; 2 intralares; 2 dorsocentraes postsuturaes havendo em alguns exemplares mais uma ou duas cerdas pequenas anteriores; 2 ou 3 pequenas cerdas dorsocentraes presuturaes; acrostichaes ausentes, prescutellar pequena. Ha 2 pares de marginaes escutellares e um par apical pouco desenvolvido.

Abdomen cinzento sem reflexos dourados; segundo e terceiro tergitos sómente com cerdas lateraes, quarto com um par mediano e quinto com uma serie de cerca de 16 cerdas em toda a margem. Esternitos 1 a 4 com pêlos pretos mais desenvolvidos nas margens posteriores; quinto esternito profundamente fendido e com uma formação longa mediana que tem cerdas fortes na parte posterior e uma terminação preta e sem pêlos. Nunca observei tal formação em nenhuma das especies que examinei; sómente esta especie e *S. crispina* n. sp. teem tal constituição no quinto esternito. Segmentos genitaes vermelhos, o primeiro com pollinosidade dourada numa faixa estreita apical e com uma

serie de cerca de 6 cerdas immediatamente antes desta região dourada, o resto do segmento é recoberto de pêlinhos pretos como o segundo segmento. Forceps com uma parte basal vermelha e recoberta de pêlos longos, extraordinariamente dobrado no meio e com o apice preto e brilhante. Peça accessoria avermelhada e penis muito desenvolvido.

Patas pretas, as tibias, principalmente as posteriores são um pouco avermelhadas. Femur médio com 5 a 6 cerdas pouco desenvolvidas no meio da face anterior; femur posterior com uma serie de cerdas dorsaes e umas poucas cerdas logo abaixo destes na face anterior; na face ventral as cerdas são muito reduzidas, sendo apenas bem visiveis as 2 ou 3 apicaes. Tibia anterior com 2 cerdas basaes na face anterior e uma logo abaixo do meio da face posterior; tibias médias com uma cerda mediana na face anterior e 2 na face posterior. Tibia posterior com 2 cerdas na face anterior, 2 na posterior e uma preapical na face ventral.

Azas hyalinas, por vezes um pouco infuscadas nas nervuras; r_1 sem cerdas, $r\,4+5$ com cerdas até 2/3 da distancia da sua base á nervura transversa. Calypteros brancos, leitosos, sem nenhuma mancha escura.

Femea: — Semelhante ao macho.

Fronte cerca de 0,27 da largura da cabeça. Ha 2 cerdas proclinadas na fronte, a cerda vertical externa mede cerca de metade da vertical interna.

A tibia anterior tem 3 cerdas antes do meio na face anterior; o femur médio tem cerca de 4 cerdas fortes na face anterior; a tibia média tem 2 cerdas longas na face anterior e 3 menores na posterior. Cerdas apicaes do escutello ausentes.

HOLOTYPO: — Macho do Rio de Janeiro, 2. 1935.

ALLOTYPO: — Femea do Rio de Janeiro (Jacarépaguá) 9. 932.

PARATYPOS: — 1 macho de 8. 931, 2 machos de 9. 931, 4 machos de 11. 931, 8 machos de 12. 931, 1 macho de 1. 932, 2 machos de 2. 932, 1 macho e 1 femea de 6. 932, 2 machos de 8. 932, 3 machos e 1 femea de 9. 932; 1 macho de 1. 934, 1 macho de 2. 935, 6 machos de 7. 936, 1 macho de 29. 4. 936 e 1 macho de 10. 5. 936, todos do Rio de Janeiro; 2 machos de 3. 12. 932, de Pinheiros, E. de S. Paulo.

Esta especie se cria facilmente em carne ou agar-soro e obtive larvas a 31. 8. 932, pupas a 7. 9. 932 e adultos a 23. 9. 932.

Sarcophaga crispina n. sp.

(Est. 1, fig. 5; est. 2, figs. 1 e 2).

Muito proxima de *S. crispula*, n. sp. differindo pela constituição da genitalia do macho e do 5.º esternito abdominal.

Macho: — Comprimento total 9 a 13 mm.

Face, fronte e orbitas oculares posteriores amarellas sendo o vertex mais claro. Parte posterior da cabeça cinzenta tendo alguma tonalidade amarellada em alguns exemplares. Fronte com cerca de 0,22 da largura da cabeça. Vitta frontal escura, opaca, com cerca de 0,14 da largura da fronte

ao nivel da cerda frontal superior. Cerdas ocellares reduzidas, vertical externa ausente. Frontalia e facialia com poucos pêlinhos, sendo que em alguns exemplares a facialia tem pêlos bem fortes junto ás orbitas oculares. Ha 9 a 11 cerdas frontaes sendo as 3 ou 4 mais inferiores nitidamente divergentes e a ultima attinge o nivel do terço apical do segundo segmento da antenna. Antennas escuras, o segundo segmento mede cerca de 0,3 do comprimento do terceiro que attinge os 0,83 da distancia desde a base ao nivel das vibrissas, que se acham situadas logo acima da margem oral. Parafacialia com 0,45 da distancia entre as grandes vibrissas. Facialia com pêlos até um pouco acima do meio. Parte posterior da cabeça com 3 series de cerdas pretas sendo os pêlos da metade inferior, claros.

Thorax: Humero, mesopleura e metapleura fortemente amarellados. Ha 3 cerdas humeraes, uma posthumeral, 3 supralares postsuturaes e uma presutural; 2 intralares; 2 dorsocentraes postsuturaes havendo por vezes mais 1 ou 2 muito reduzidas; 2 ou 3 presuturaes dorsocentraes pouco notaveis, acrostichaes ausentes, prescutellar pequena. Ha 2 pares de fortes cerdas marginaes do escutello e um pequeno par apical cruzado.

Abdomen cinzento sem pollinosidade amarella. Tergitos 2 e 3 sómente com cerdas lateraes, 4.º com um forte par mediano e 5.º com uma serie de cerca de 20 cerdas em toda a margem. Esternitos 1 a 4 com pêlos finos e esparsos sendo mais longos na margem posterior; 5.º esternito profundamente sulcado mas com uma protuberancia mediana que termina em 2 pontas. Segmentos genitaes vermelhos: o primeiro tem a base escurecida, uma serie de 6 cerdas preapicaes e entre estas e a margem posterior uma região intensamente dourada; o segundo é inteiramente brilhante e tem pêlinhos pretos esparsos. Forceps pretos, fortemente chitinizados, com uma parte basal coberta de pêlos muito longos, medianamente muito curvo e com fortes espinhos e apicalmente agudo e curvo. Peça accessoria larga e achatada. Penis grande e com formações diversas anteriormente.

Patas pretas. Femur médio com 3 a 4 cerdas no meio da face anterior; face ventral com poucas cerdas e apicalmente sem ctenideo. Femur posterior com cerdas muito longas na face dorsal, algumas cerdas mais curtas na face anterior e sómente 3 cerdas apicaes na face ventral. Tibia anterior com uma cerda pouco depois da base na face anterior e uma preapical na face posterior. Tibia média com uma cerda mediana na face anterior e 3 na face posterior. Tibia posterior com 2 cerdas medianas afastadas nas faces anterior e posterior e uma preapical na face ventral.

Azas hyalinas, r 1 núa, r 4 + 5 com cerdas até a metade da distancia que vae da base até a nervura transversa. Calypteros brancos.

Femea: — Comprimento total 9 mm.

Fronte com cerca de 0,62 da largura da cabeça. Escutello com cerdas apicaes reduzidas e muito afastadas. Quinto esternito abdominal muito mais largo que os demais.

Tibia anterior com 3 cerdas na metade basal. Tibia mediana com 2 cerdas na face anterior e uma cerda muito longa na face ventral.

HOLOTYPO: — Macho do Rio de Janeiro, 7. 935.
ALLOTYPO: — Femea da mesma localidade (obtida de cultura) 8. 935,
PARATYPOS: — 2 machos do Rio de Janeiro, H. S. Lopes leg. 12. 931;

2 machos de 9. 932; 1 macho 9. 931; 2 machos e 2 femeas de 7. 935; 1 macho de 8. 935; 1 macho de 3. 935; 3 machos de Angra dos Reis, prof. L. Travassos leg., 12. 932; 1 macho de Jussaral, Angra dos Reis, prof. L. Travassos. Oiticica e J. Lins leg., 12. 931; 2 machos de Jussaral, Angra dos Reis, Penido leg., 4. 931; 1 macho da Repreza Camorim, Rio de Janeiro, 1. 933; 2 machos da Tijuca. Rio de Janeiro, Seabra leg., 1. 933; 1 macho do Corcovado, Rio de Janeiro, L. Travassos Filho leg., 1. 932; 1 macho do Corcovado, Prof. A. M. da Costa Lima leg. 3. 932; 1 macho de Botafogo, Haroldo Travassos leg. 2. 931; 2 machos do Rio de Janeiro. D. Mendes leg., 1 macho de Japuhyba, Angra dos Reis, D. Mendes leg.; 1 macho de São Paulo (Capital) J. Lane leg. e 1 macho de S. José dos Campos, H. S. Lopes leg. 10. 933.

Obtive uma cultura desta especie em gelose + soro normal de cavallo com larvas a 19. 7. 935 e 3 adultos a 19. 8. 935.

Sarcophaga epimelia n. sp.

(Est. 2. figs. 3 e 4).

Muito semelhante a *S. collusor* Curran & Walley, 1934 e *S. adolenda* Lopes, 1935 differindo principalmente pela constituição do forceps.

Macho: — Comprimento total 12 mm.

Cabeça dourada, parte posterior com alguns tons cinzentos. Fronte com cerca de 0,18 da largura da cabeça; superiormente escurecida, ao nivel da cerda frontal superior. Vitta frontal muito preta e opaca, medindo 0,5 da largura da fronte. Cerdas ocellares reduzidas, mal se differenciando dos demais pêlos da região. Cerdas verticaes externas ausentes; verticaes internas longas, sendo a região entre estas ultimas coberta de pollen prateado, que pode ser substituido por uma coloração mais dourada em exemplares de cabeça muito fortemente dourada. Frontalia com pequenos pêlos nas orbitas oculares. Ha 9 a 11 cerdas frontaes que alcançam inferiormente a terça ou metade basal do 2.º articulo antennal. O 2.º articulo das antennas é preto ou pardo muito escuro, o 3.º é pardo claro; o 2.º articulo mede cerca de 0,4 do comprimento do 3.º e as antennas occupam 0,8 da distancia até o nivel das vibrissas que se acham situadas logo acima da margem oral. Parafacialia com pequenos pêlos nas margens oculares, medindo cerca de 0,45 da distancia entre as grandes vibrissas. Parte posterior da cabeça com uma serie de cerdas postoculares e logo abaixo 2 series de cerdas pretas dispostas irregularmente; os demais pêlos são amarellos.

Thorax: faixas dorsaes muito nitidas mesmo no escutello, onde a faixa mediana é muito larga. Humero, propleura, mesopleura e pteropleura amarellados, o restante cinzento. Ha 2 fortes cerdas dorso-centraes post-suturaes, presuturaes ausentes; acrostichaes representadas apenas pela prescutellar; humeraes 3 ou 4; supralares 3; intralares 2; uma supralar presutural; esternopleuraes 3 quasi na mesma linha recta; ha 3 pares de lateraes escutellares, um pequeno par apical.

Abdomen cinzento amarellado; mais fortemente amarello no ultimo tergito. O 2.º e o 3.º tergitos teem sómente cerdas lateraes; o 4.º tem um par

mediano e o 5.º uma serie de cerca de 12 cerdas em toda a margem. Esternitos 1 a 4 quasi nús, o 4.º tem uma serie de cerdas longas na margem posterior e o 5.º é tão largamente fundido que a fenda tem a largura do 4.º esternito. Segmentos genitaes vermelhos, o 1.º escurecido na metade basal e coberto de pollinosidade dourada na metade apieal. Ambos são cobertos de pêlos regularmente dispostos e do mesmo comprimento.

Patas pretas. Femur anterior com cerdas na face dorsal e ventral sendo estas ultimas mais longas que o diametro do femur; femur médio com 2 cerdas preapicaes na face posterior, 5 ou 6 cerdas em serie no meio da face anterior e 2 series na face ventral sendo que a mais posteriormente situada se transforma em forte ctenideo (com cerca de 5 espinhos) no apice. Tibia anterior com 2 cerdas basaes na face anterior; tibia média com uma forte cerda mediana na face anterior e outra bem menor na face posterior; tibia posterior com 3 fortes cerdas na metade basal da face anterior; 1 preapical na face ventral e 2 medianas na face posterior.

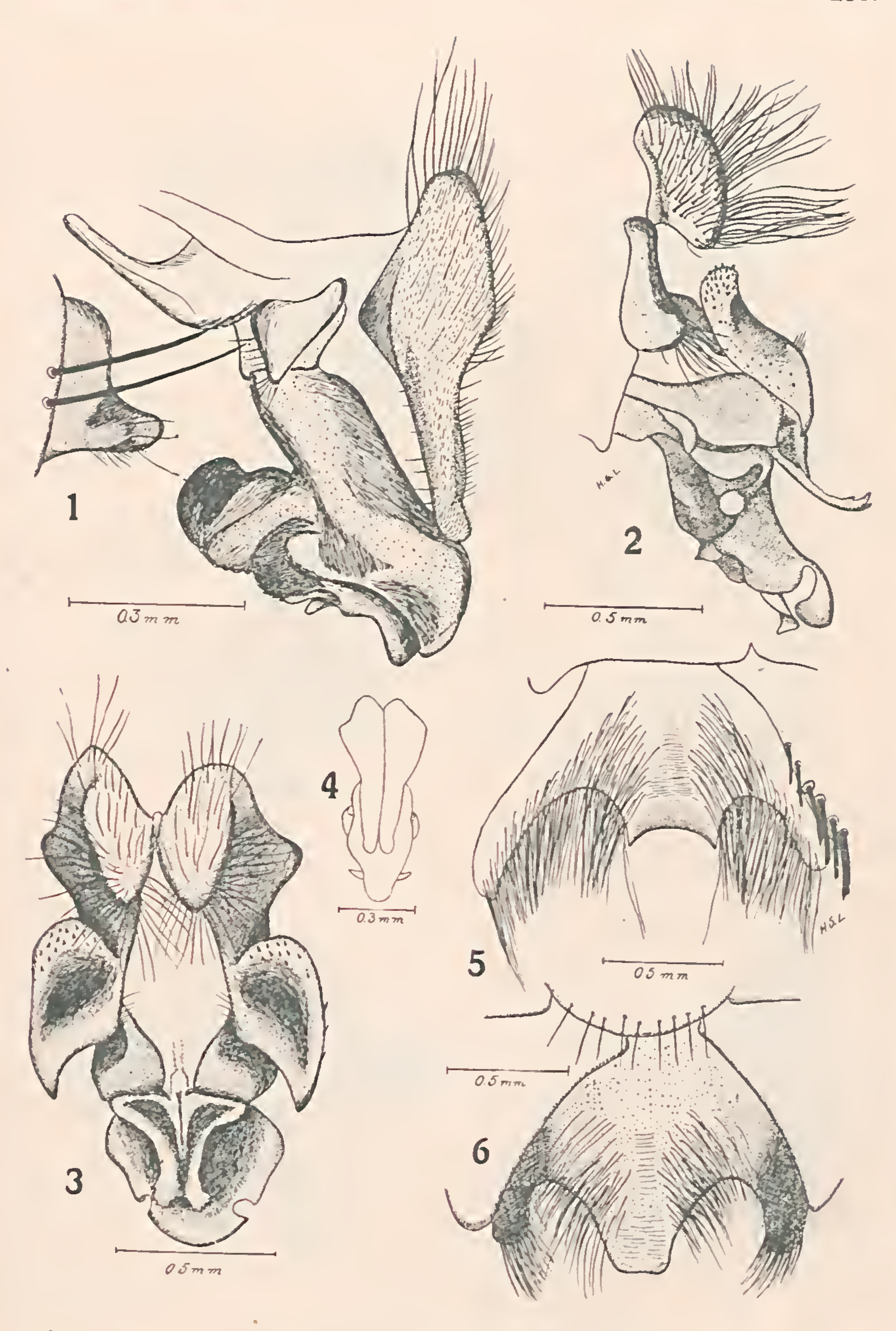
Azas hyalinas, espinho costal reduzido, r 1 sem cerdas, r 4 + 5 com cerdas até 2/3 da distancia entre a base e a nervura transversa.

HOLOTYPO: — Macho de São Paulo (Capital).

PARATYPOS: — 4 machos de Lussanvira (S. Paulo) e 1 macho de Engenheiro Lefevre (E. de S. Paulo), todos recebidos do Prof. S. B. Pessoa, da Faculdade de Medicina de S. Paulo.

Estampa 1

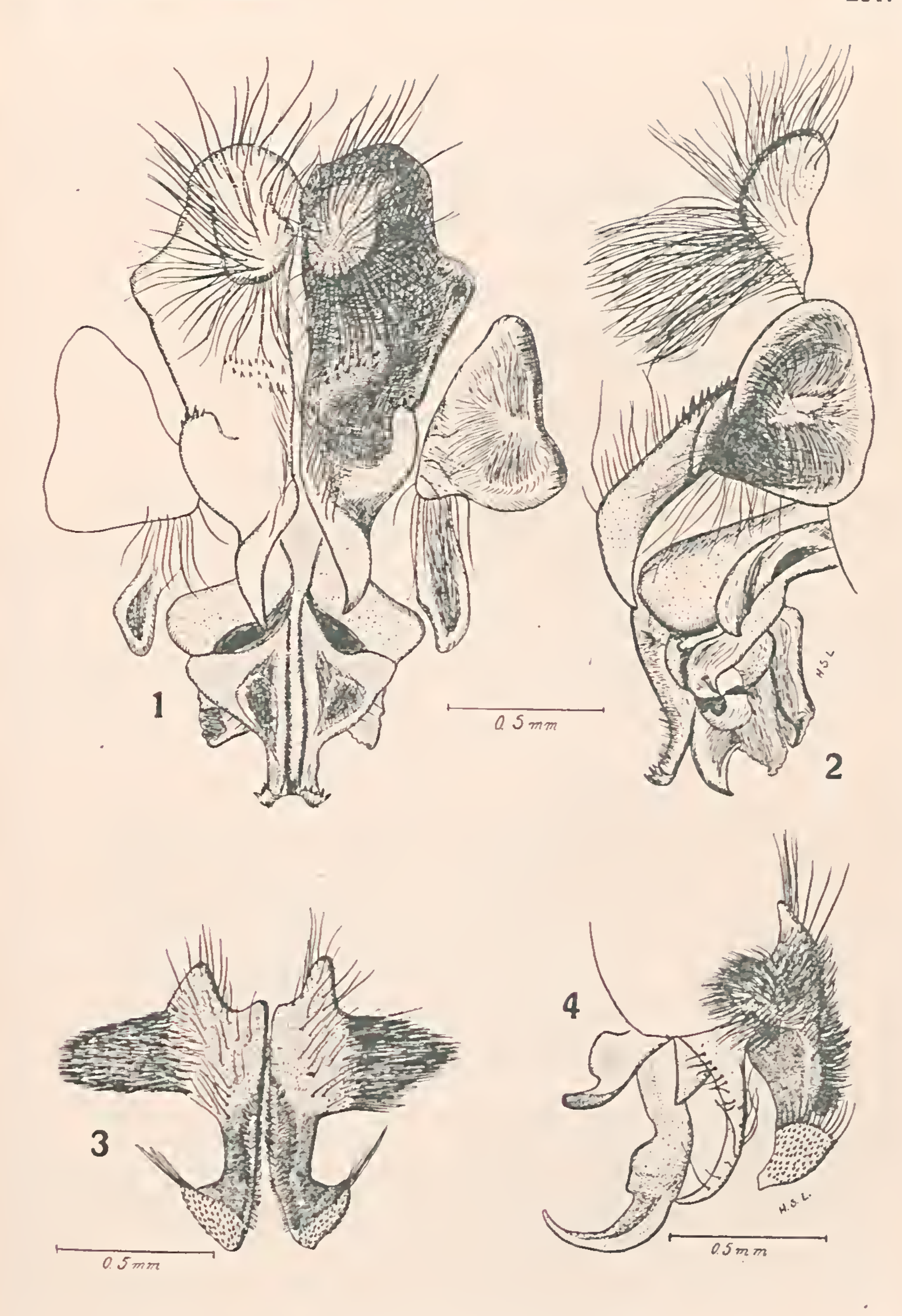
Fig. 1 — *Nephochaetopteryx travassosi* n. sp., genitalia, vista lateral.
Fig. 2 — *Sarcophaga crispula* n. sp., genitalia, vista lateral.
Fig. 3 — *Sarcophaga crispula* n. sp., genitalia, vista dorsal.
Fig. 4 — *Nephochaetopteryx travassosi* n. sp., genitalia, vista dorsal.
Fig. 5 — *Sarcophaga crispina* n. sp., 5.º esternito do macho.
Fig. 6 — *Sarcophaga crispula* n. sp., 5.º esternito do macho.



Lopes: Novas especies de Sarcophagideos.

Estampa 2

Fig. 1 — *Sarcophaga crispina* n. sp. Genitalia, vista dorsal.
Fig. 2 — *Sarcophaga crispina* n. sp. Genitalia, vista lateral.
Fig. 3 — *Sarcophaga epimelia* n. sp. Genitalia, vista dorsal.
Fig. 4 — *Sarcophaga epimelia* n. sp. Genitalia, vista lateral.



Lopes: Novas especies de Sarcophagideos.

Contribuição ao conhecimento do genero Neivamyia Pinto et Fonseca, 1930 e descripção de uma nova especie

(Diptera: Muscidae)

H. de Souza Lopes e **O. Mangabeira Filho**
Instituto Oswaldo Cruz, Rio de Janeiro e Instituto de Pathologia Experimental do Norte, Pará — Brasil

[Com 4 estampas]

O Prof. Samuel B. Pessôa teve a gentileza de nos enviar recentemente 2 exemplares machos de uma mosca hematophaga que verificamos ser uma nova especie do genero *Neivamyia*. Foram capturados em Outubro de 1936 pelo Snr. C. Worontzow em Manacapurú, Estado do Amazonas.

O genero *Neivamyia* comprehende actualmente 4 especies, todas neotropicas, sendo que, de duas dellas, sómente o macho é conhecido: *N. lutzi* Pinto & Fonseca, 1930, do sul do Brasil; *N. flavicornis* (Malloch, 1928), de Surinam e Trinidad; *N. latifrons* Malloch, 1932, de Iquitos (Perú) e Belém (Pará) e a especie que descrevemos no presente trabalho.

Neivamyia lutzi Pinto & Fonseca, 1930.

Neivamyia lutzi Pinto & Fonseca, 1930, pag. 24, est. 1 a 3.
Neivamyia lutzi Borgmeier, 1931, pag. 224, fig. 1.
Neivamyia lutzi Pinto, 1931 (a), pag. 19.
Neivamyia lutzi Pinto, 1931 (b), pag. 248.
Neivamyia lutzi Pinto & Fonseca, 1931, pag. 261.
Neivamyia lutzi Townsend, 1931, pag. 479.
Neivamyia lutzi Malloch, 1932, pag. 429.
Neivamyia lutzi Pinto & Lopes, 1933, pag. 78.
Neivamyia lutzi Townsend, 1935, pag. 128.
Neivamyia lutzi Townsend, 1937, pag. 27.

Malloch, em 1932, e Townsend, em 1931 consideram os typos de *N. lutzi* e *N. flavicornis* como exemplares de uma mesma especie. Townsend, em 1935 e 1937, distingue estas duas especies, sendo a differença entre a largura da fronte sufficiente para separal-as. Além disso, depois do conhecimento de *N. travassosi* n. sp., que apresenta coloração muito mais escura que *N. lutzi* e, como é de crer que se encontre em *N. flavicornis*, é justa a observação de Aldrich transcripta no trabalho de Townsend (1931) quando se refere ao exame dos exemplares de *N. flavicornis*, comparando-os com a descripção de *N. lutzi* feita por Borgmeier:

«they do not have as much yellow on the thorax as Frei Borgmeier gives — only the humeri and a little space below are yellow».

N. lutzi se apresenta com uma coloração muito clara e a região amarella é muito extensa. Damos desenhos da cabeça em duas posições, e detalhes da genitalia do macho.

Neivamyia flavicornis (Malloch, 1928).

Bdeltolarynx flavicornis Malloch, 1928, pag. 318.
Neivamyia flavicornis Malloch, 1932, pag. 429.

Desta especie só se conhecem 3 exemplares, da Guyana Hollandeza e de Trinidad. No presente trabalho reproduzimos as duas figuras de cabeça publicadas por Malloch em 1932.

Neivamyia latifrons Malloch, 1932.

Neivamyia latifrons Malloch, 1932, pag. 431.

Esta especie facilmente se distingue das demais pela presença de cerdas proclinadas da fronte, em ambos os sexos.

Neivamyia travassosi n. sp.

Esta especie se approxima de *N. flavicornis* Malloch, differindo principalmente pela maior largura da fronte em relação a cabeça e pelo segmento apical da tromba, que é mais curto que a altura do olho. Comparando-se os desenhos da cabeça desta especie com as que aqui reproduzimos da de *flavicornis* verificam-se facilmente estas differenças.

Macho: — Comprimento total: 6 mm.

Cabeça com polinosidade amarello-pallida. Fronte com cerca de 0,119 da largura da cabeça. Vitta frontal preta, opaca, com cerca de 0,37 da largura da fronte ao nivel do ocello anterior. Cerdas ocellares bem desenvolvidas; vertical externa pouco mais longa que as demais cerdas postoculares. Parafacialia sem pêlos junto as orbitas oculares. Frontalia sem pêlinhos. Ha 10 a 11 cerdas frontaes sendo que a mais inferiormente situada attinge a base da lunula, não divergentes inferiormente. Antennas amarelladas, o 1.º e a base do 2.º articulo escurecidos. O 2.º articulo mede 0.31 do comprimento do 3.º que attinge 0,91 da distancia entre a base das antennas e o nivel das grandes vibrissas, que se acham na margem oral. Parafacialia com 0,13 da distancia entre as grandes vibrissas. Facialia com 2 ou 3 pêlos junto as vibrissas. Arista plumosa com raios esparsos tendo 7 a 8 superiores e sómente 3 inferiores. Parte posterior da cabeça cinzenta, fracamente amarellada, a metade superior abaixo da serie de cilios postoculares quasi nua com poucos pêlos pretos; a metade inferior com maior numero de pêlos pretos e alguns pêlinhos claros junto a margem buccal. Palpos amarellos alaranjados, bem mais escuros que as antennas, cobertos de pêlos fortes dorsalmente, com 3 cerdas bem fortes apicaes e cerca de 5 pêlos longos na face ventral. Em posição de repouso o palpo não attinge o apice da tromba. Tromba castanha com o apice e a base escurecidos.

Thorax escuro com 5 faixas longitudinaes ennegrecidas; a faixa mais cen-

tral é bem visivel, larga junto ao escutello, estreitando-se para a parte anterior indo terminar num ponto. De cada lado ha 2 faixas muito juntas, a mais interna ao nivel das cerdas dorsocentraes, a mais externa ao nivel das cerdas intralares. A região entre estas faixas apresenta uma polinosidade fracamente amarellada, por vezes pouco nitida. No centro ha uma região escurecida, ao nivel da sutura transversa do mesonoto, onde a coloração das faixas se confunde com a do mesonoto. Pleuras apresentando polinosidade um pouco mais fraca do que a do thorax, por vezes com tons fracamente prateados. Ha 2 cerdas humeraes, 1 posthumeral, 2 supralares postsuturaes e 1 presutural; 1 intralar; 3 dorsocentraes postsuturaes sómente a mais posterior bem desenvolvida; presuturaes dorsocentraes e acrostichaes ausentes; prescutellar presente. Ha 2 pares de cerdas marginaes do escutello e 1 par apical. Duas cerdas esternopleuraes; propleura nua e proesterno com pêlos pretos.

Abdomen escuro com polinosidade amarellada, principalmente na metade basal dos tergitos. O terceiro tergito apresenta uma mancha mediana preta, o quarto 2 manchas lateraes. Lateralmente a polinosidade é por vezes cinzenta.

Azas hyalinas, fracamente enfuscadas. Nervura *r* 1 núa; *r* 4-5 com cerdas na base, sendo que num dos exemplares existe sómente 2 cerdas em ambas as azas; no outro uma das azas tem 5 cerdas que occupam o terço basal da distancia entre a base na nervura e a nervura transversa *(r-m)*. Na outra aza *r* 4-5 tem cerdas na quarta parte da distancia que vae da base a nervura transversa e mais uma cerda que marca quasi o meio desta distancia, havendo além desta, uma outra na parte apical na nervura. Balancins amarellos.

Patas castanho-escuras. Coxa anterior apresentando polinosidade amarella. Apices dos femures e as tibias mais claras. Femur anterior com 2 series de cerdas, uma dorsal e outra ventral, sendo que as desta são muito mais longas que as da serie dorsal. A face posterior, na sua metade superior, apresenta 2 series de cerdas mais ou menos regulares, sendo lisa a metade inferior. O femur médio apresenta 3 cerdas longas, medianas, na face anterior; 2 cerdas preapicaes na face posterior, e 2 outras proximas na base, na face ventral. O femur posterior apresenta uma serie de cerdas na face dorsal, uma cerda longa e delgada preapical na face inferior e uma outra muito fina, perto da base.

HOLOTYPO e PARATYPO na collecção do Instituto Oswaldo Cruz organizada pelo prof. Cesar Pinto, n.º 884 e 885. Capturados em Manacapurú, no Estado do Amazonas (Brasil) em Outubro de 1936, por C. Worontzow.

Chave para a determinação das especies de moscas hematóphagas do genero Neivamyia autochtones da Região neo-tropica, baseada nos exemplares machos.

1.	Ambos os sexos com cerdas orbitarias proclinadas na fronte. *Neivamyia latifrons* Malloch, 1932. Perú (Iquitos) e Brasil (Estado do Pará).	
1 a.	Machos sem cerdas proclinadas na fronte	2.
2 (1 a).	Fronte do macho medindo menos de 1/10 da largura da cabeça. Est. 1, figs. 3 e 4. *Neivamyia flavicornis* (Malloch, 1928). Guyana hollandeza.	
2 a.	Fronte do macho medindo mais de 1/10 da largura da cabeça	3.

3 (2 a). Proboscida medindo cerca do comprimento da altura maxima do olho. Est. 1, figs. 1 e 2. Est. 3, figs. 1 e 2. *Neivamyia lutzi* Pinto & Fl. Fonseca, 1930. Brasil (Est. do Rio, S. Paulo).

3 a. Proboscida mais curta do que a altura maxima do olho. Est. 1, figs. 5 e 6. Est. 3, figs. 3 e 4. *Neivamyia travassosi* n. sp., Brasil (Est. do Amazonas).

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Estampa 1

Fig. 1 — Perfil da cabeça do macho de *Neivamyia lutzi*. Original.

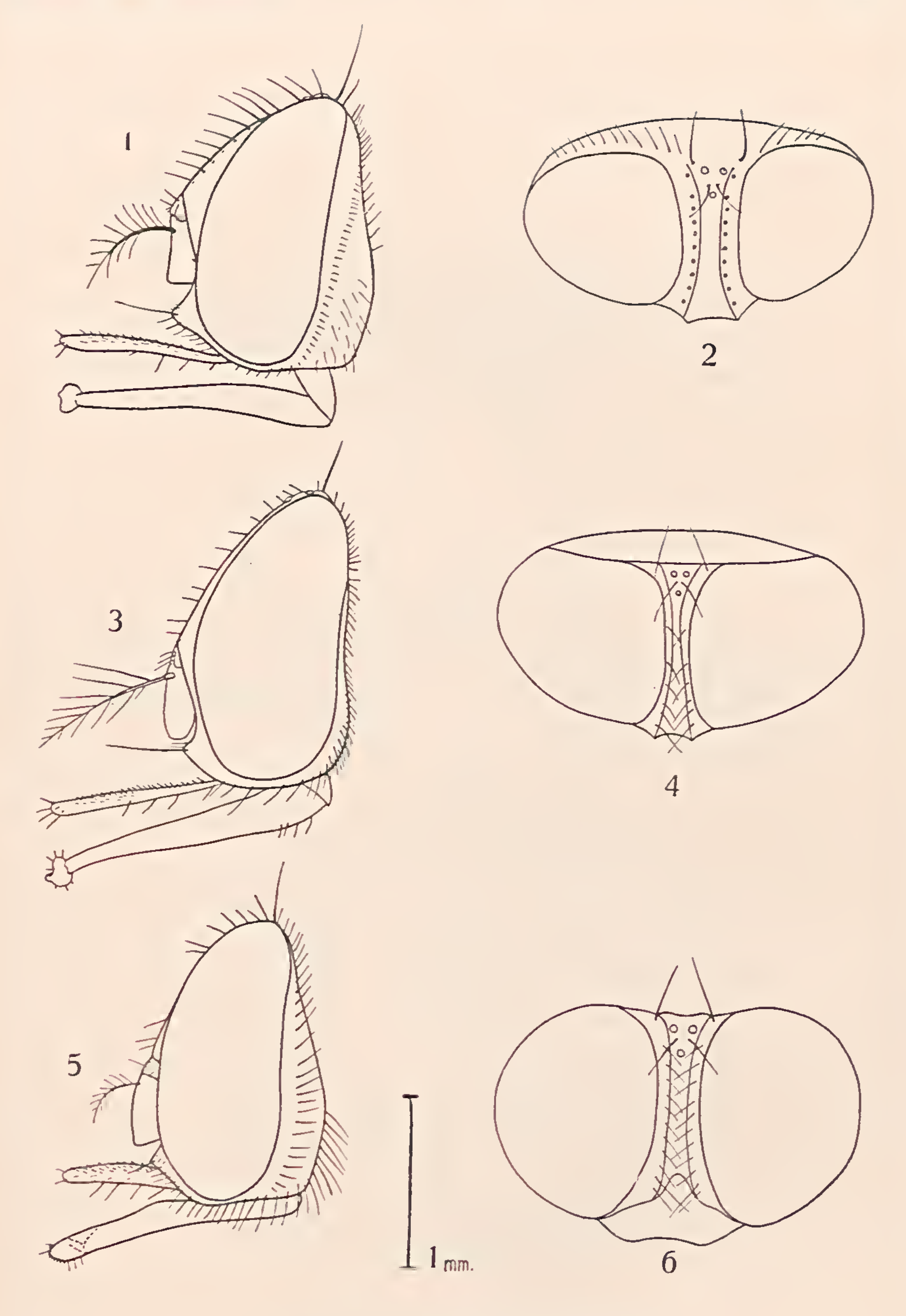
Fig. 2 — Cabeça vista de frente do macho de *Neivamyia lutzi*. Original.

Fig. 3 — Perfil da cabeça do macho de *Neivamyia flavicornis*. Segundo Malloch. 1932. The Ann. Mag. Nat. Hist. IX. Tenth Ser., p. 430.

Fig. 4 — Cabeça vista de frente do macho de *Neivamyia flavicornis*. Segundo Malloch. 1932.

Fig. 5 — Perfil da cabeça do macho de *Neivamyia travassosi*. Original.

Fig. 6 — Cabeça vista de frente do macho de *Neivamyia travassosi*. Original. As figs. 1, 2, 5 e 6 foram feitas na mesma escala.

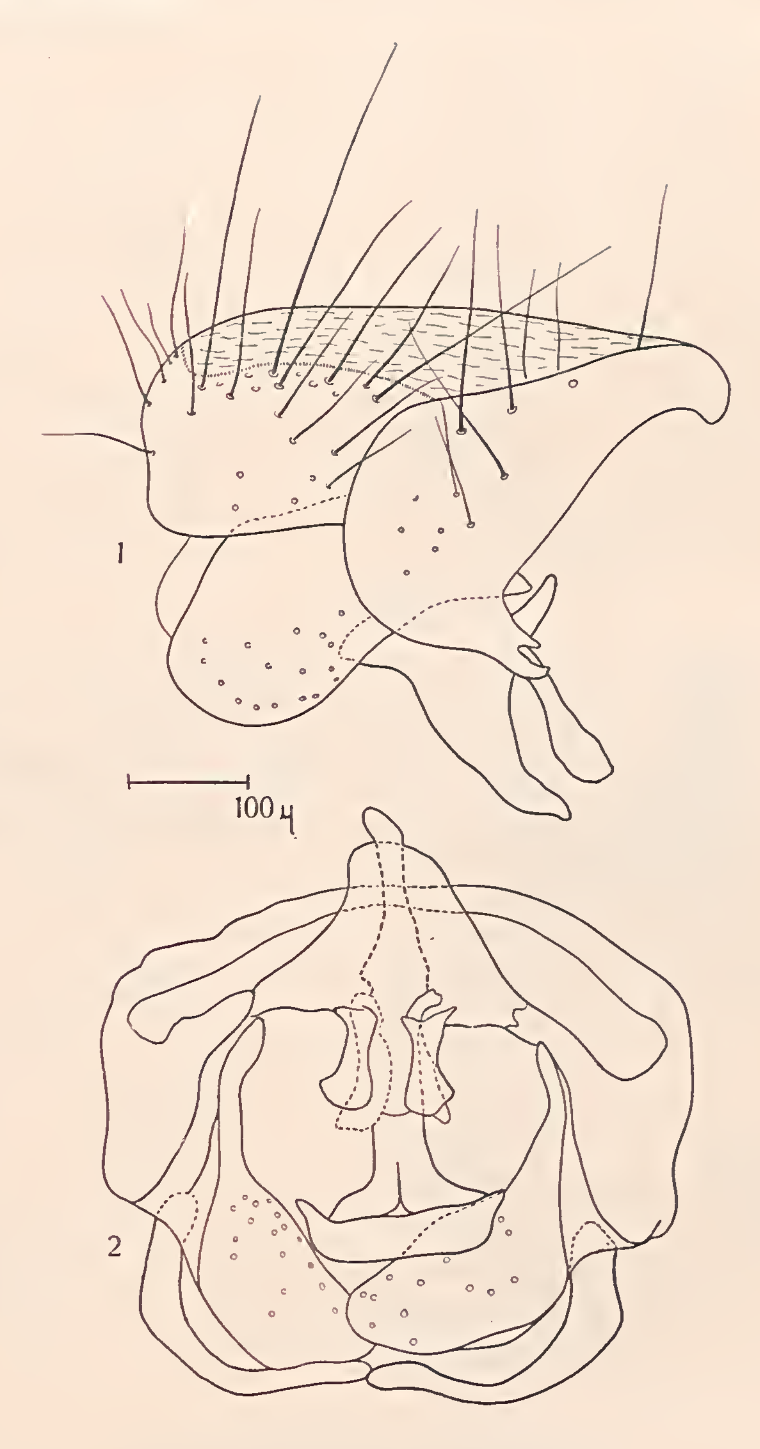


Lopes & Mangabeira: Genero *Neivamyia*.

Estampa 2

Fig. 1 — Hypopygio do macho, visto de perfil, de *Neivamyia travassosi*. Original.

Fig. 2 — Hypopygio do macho, visto de frente, de *Neivamyia travassosi*. Original.



Lopes & Mangabeira : Genero *Neivamyia*.

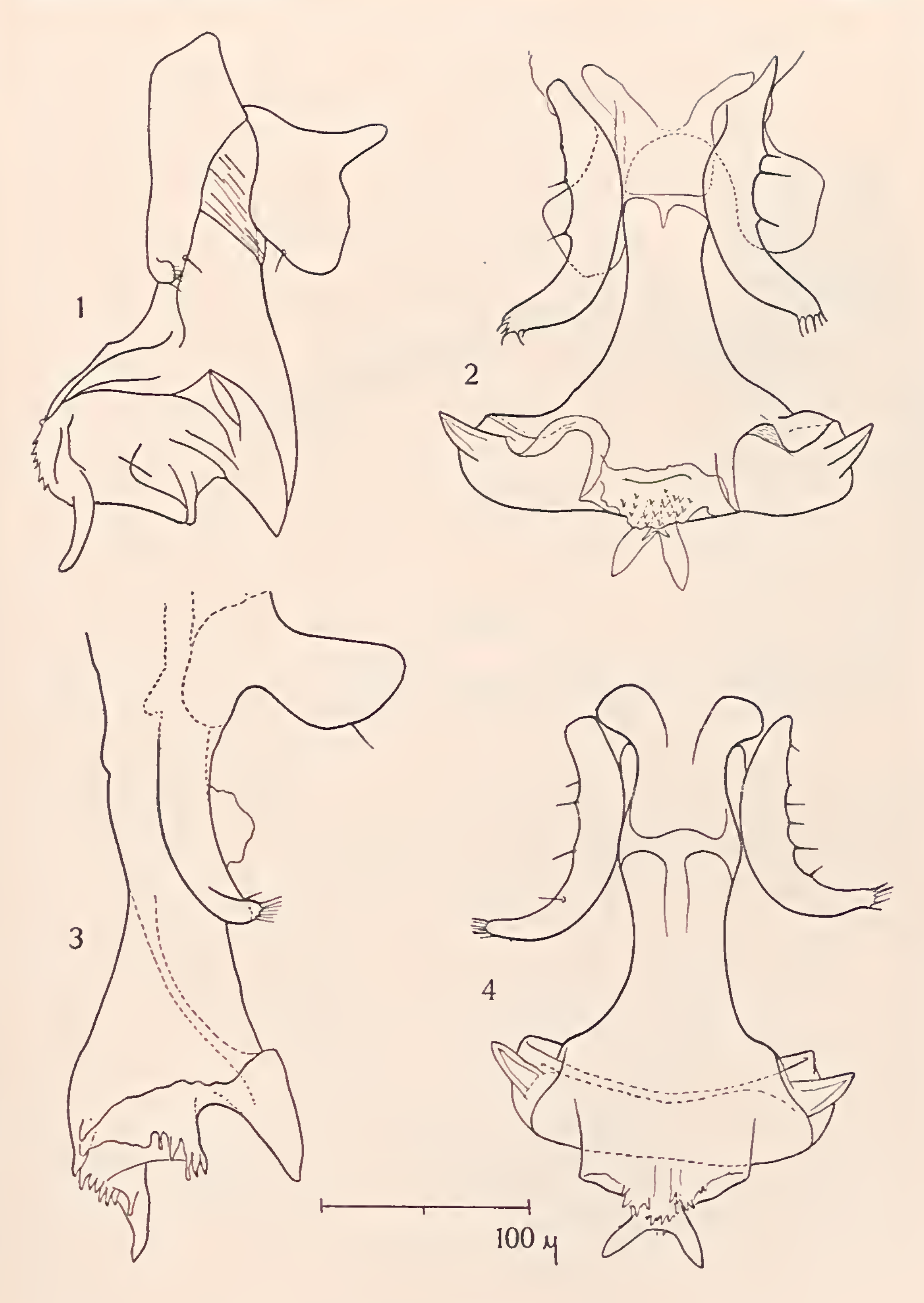
Estampa 3

Fig. 1 — Detalhes do hypopygio do macho de *Neivamyia lutzi*, visto de perfil, Original.

Fig. 2 — Detalhes do hypopygio do macho de *Neivamyia latzi*, visto de frente. Original.

Fig. 3 — Detalhes do hypopygio do macho de *Neivamyia travassosi*, visto de perfil. Original.

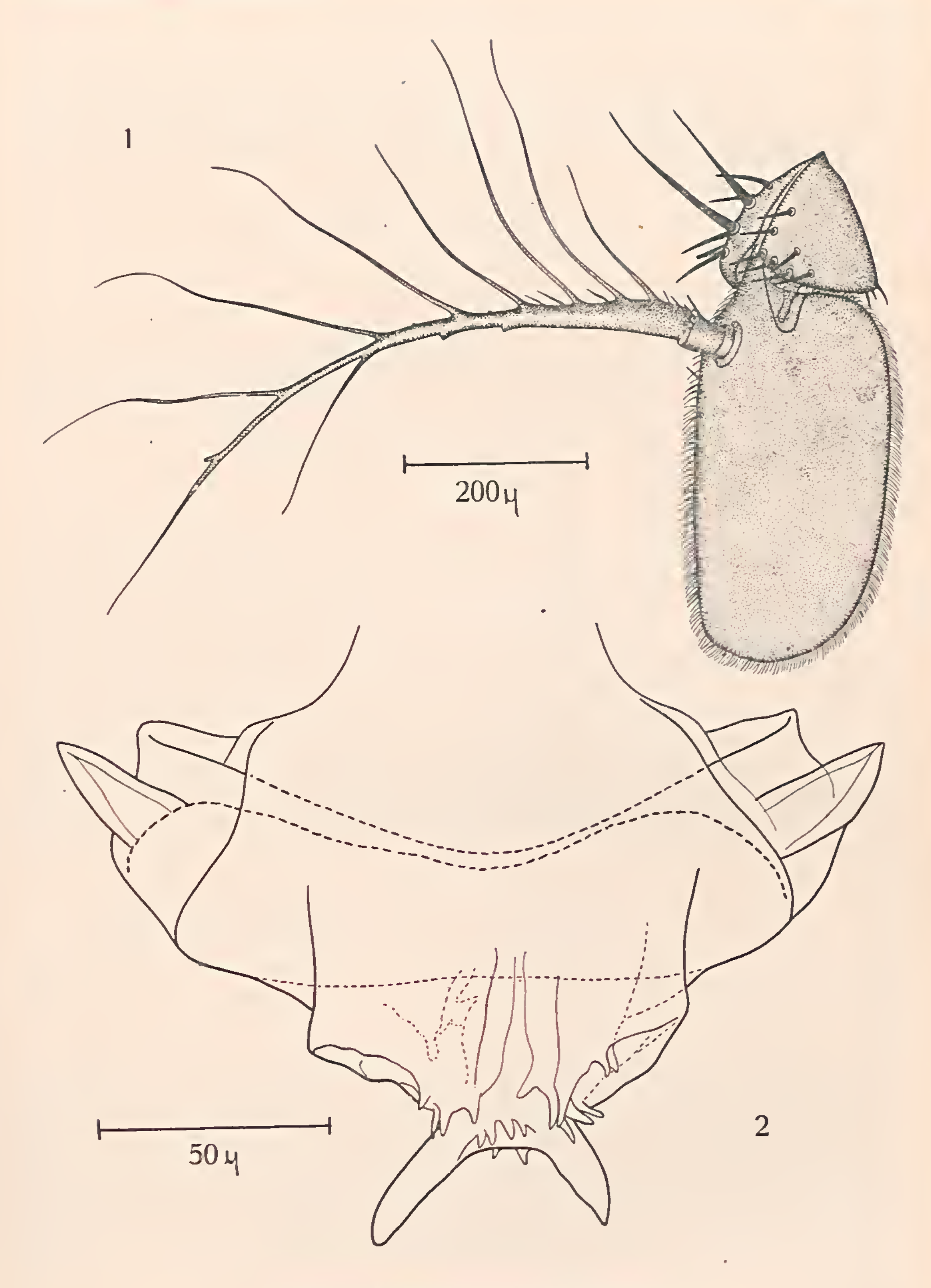
Fig. 4 — Detalhes do hypopygio do macho de *Neivamyia travassosi*, visto de frente. Original.



Lopes & Mangabeira: Genero *Neivamyia.*

Estampa 4

Fig. 1 — Antenna de *Neivamyia travassosi*. Original.
Fig. 2 — Extremidade do penis de *Neivamyia travassosi* (vista ventral). Original



Lopes & Mangabeira: Genero *Neivamyia.*

A New Species of Trematode, Prosthodendrium travassosi, (Lecithodendriidae) from a Minnesota bat

Ralph W. Macy

College of St. Thomas, St. Paul, Minnesota – U. S. A.

[With 1 plate]

The following new species of fluke was found to occur rather commonly in the intestine of the big brown bat, *Eptesicus fuscus*. in Minnesota. In this description, the measurements refer to the type specimen.

Prosthodendrium travassosi n. sp.

(Plate 1, figs. 1-2).

Specific diagnosis: — Prosthodendrium. — Body elongate, flask-shaped, aspinose, 0.87 mm. long by 0.5 mm. wide. Oral sucker subterminal, 0.085 mm. in diameter. Ventral sucker 0.08 mm. in diameter, slightly pre-equatorial. Pharynx 0.037 mm. wide by 0.033 mm. long. Oesophagus 0.1 to 0.2 mm. long, thus being more extensive than usual for a member of the genus. Intestinal ceca short and reaching prostate mass, but not quite touching testes. Testes oval, 0.15 to 0.17 mm. long, partially or entirely posterior to ventral sucker. Prostate mass 0.14 mm. wide by 0.08 mm. long. Genital pore opening directly from prostate mass. Ovary ovate, partially or entirely posterior to ventral sucker, filling most of the region between the testes, 0.18 mm. wide by 0.13 mm. long. Vitelline glands bilateral, situated posterior to the intestinal ceca and overlapping the testes. Uterus largely filling the posterior portion of the body. Eggs 0.012 mm. wide by 0.023 mm. long.

HOST: — *Eptesicus fuscus* (Beauvois).
LOCATION: — Intestine.
LOCALITY: — United States (St. Paul, Minnesota).
TYPE SPECIMEN: — U. S. Nat. Mus. Helm. Coll., paratypes, author's collection.

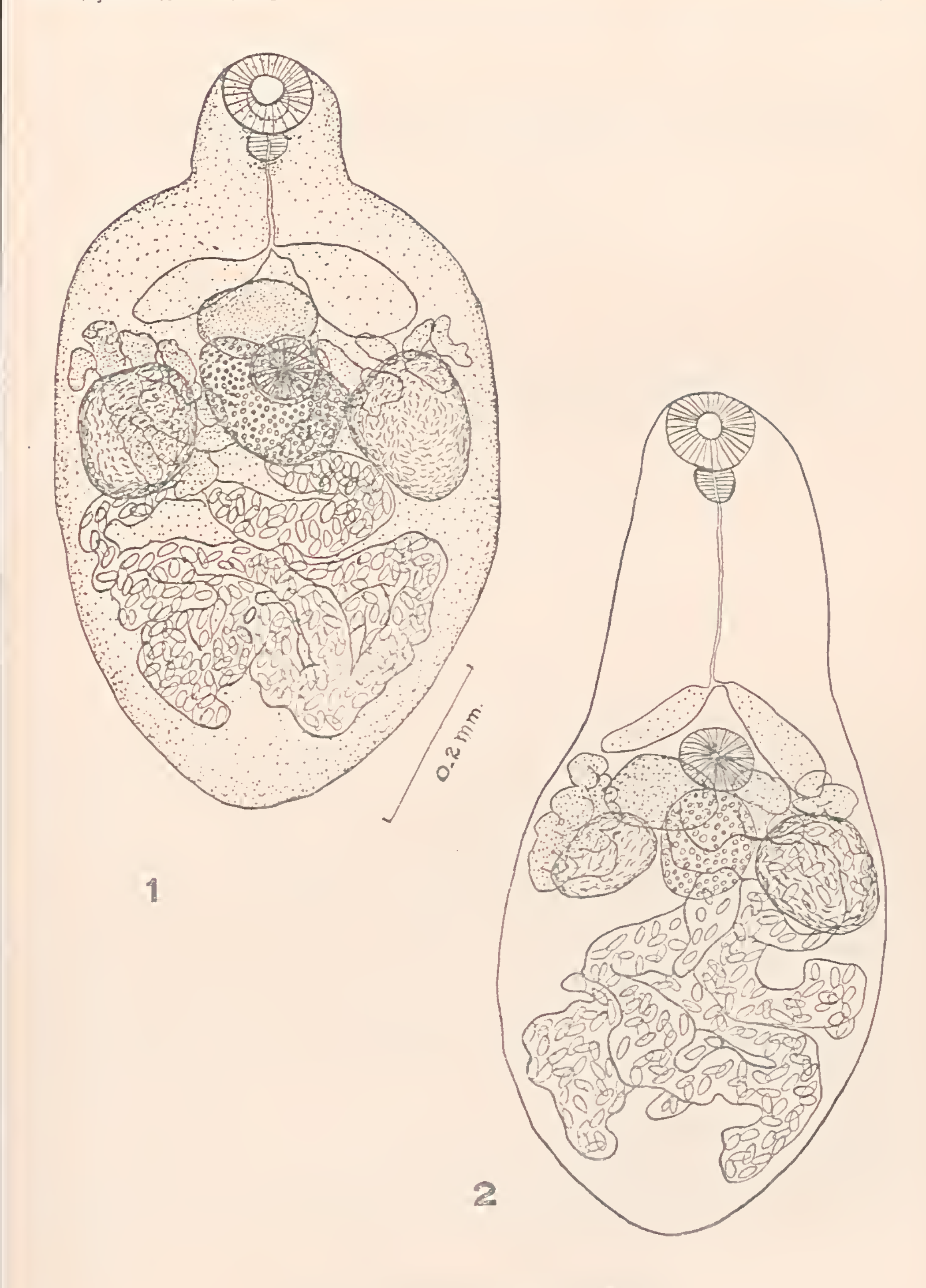
This fluke differs from other members of the genus as follows: — oral sucker aspinose separates it from *P. orospinosa* (Bhalerao, 1926 a); vitelline follicles not extending to oral sucker distinguishes it from *P. swansoni* Macy, 1936; testes larger than ventral sucker separates it from *P. pyramidum* (Looss, 1896), *P. ascidia* (Van Beneden, 1873), *P. luzonicum* (Tubangui, 1928), *P. longiforme* (Bhalerao, 1926), and *P. urna* (Looss, 1907); ovary partially or entirely posterior to acetabulum separates it from *P. cordiforme* (Braun, 1900), *P. naviculum* Macy, 1936, and *P. chilostomum* (Mehlis, 1831); suckers subequal separates it from *P. dinanatum* (Bhalerao, 1926 b); ovary larger than ventral

sucker separates it from *P. liliputianum* (Travassos, 1928); and vitellaria extending well over testes distinguishes it from *P. macnabi* Macy, 1936.

A key to the species of the genus, and references to the literature have been given by the writer in a previous publication (Trans. Amer. Micro. Soc., 1936, **55** (3) : 352-359).

Plate 1

Fig. 1 — *Prosthodendrium travassosi*. Type, drawn with aid of *camera lucida*.
Fig. 2 — *Prosthodendrium travassosi*. Paratype, drawn with the aid of the *camera lucida*.



Macy: A new species of Trematode.

Two new monogenetic Trematodes from Beaufort, North Carolina *

Harold W. Manter
University of Nebraska, U. S. A.

[With 2 plates]

The trematodes described in this paper were collected by the author at the United States Bureau of Fisheries Station at Beaufort, North Carolina in 1928. All observations are from specimens killed under slight pressure and mounted in balsam.

Family *MICROCOTYLIDAE*

Microcotyle heteracantha n. sp.
(Pl. 1, figs. 1-7).

HOST: — *Cynoscion nebulosus* (Cuv. & Val.).
POSITION: — Gills.
NUMBER: — 12 specimens from 2 hosts.

Description. — The body is flattened, very elongate and slender, from 5.94 to 8 mm. in total length by 0.262 to 0.502 mm. in greatest width (somewhat posterior to midbody). The haptor is not sharply delimited from the body and is somewhat longer on the left where it measures 1.92 to 2.43 mm. in length or slightly less than 1/3 total length of the worm. The haptor bears 112 to 137 claspers on the left side and 100 to 115 on the right. The total number of claspers seems to be at least 200 and may approach 260.

Each clasper consists of relatively slender parts (Pl. 1, fig. 2). The dorsal of two sub-equatorial (horizontal) pairs of long ribs unite medianly, the ventral pair taper to a point and almost but not quite meet. At the bases of these two pairs, a third pair curves inward but is very short. Two slender meridional ribs, end to end, curve almost around the entire clasper. The anterior of these is U-shaped and forms almost a complete semicircle. It is attached to the 3 lateral pairs of ribs by a slender diagonal bar on each side at the anterior pole. Its posterior (ventral) end flares out to form two lateral points.

The mouth is bounded laterally by a pair of ovoid suckers each divided by a transverse septum. An ovoid pharynx is followed by a long esophagus which bifurcates dorsal to the genital atrium. The inconspicuous ceca extend far into the haptor region almost to the posterior end of the entire body. A few lateral and median branches are given off.

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* Studies from the Zoological Laboratories, the University of Nebraska. Nº. 193.

The common genital pore is ventral not far from the anterior end. The genital atrium (Pl. 1, fig. 3) is very complicated in structure. It possesses two pairs of suckers, one pair extending anteriorly, the other posteriorly. Each anterior atrial sucker is compound, being divided by septa into 7 chambers. Three of these chambers are anterior and somewhat larger. The remaining four are in a linear row extending backward and curving ventrally so that the terminal chamber overlaps ventrally the preceding chamber (Pl. 1, fig. 3). The anterior portion of this anterior sucker curves posteriorly and opens into the atrium by a posteriorly directed tube. The posterior edge of the first chamber is provided with a row of 12 to 13 sickle-shaped hooks (Pl. 1, fig. 4). The opening of the tubular portion of the sucker into the atrium is guarded by 7 or 8 very long slender hooks of very different shape (Pl. 1, fig. 6). Each of the two posterior atrial suckers consists of a single sac-shaped chamber with muscular walls and is somewhat narrowed near its anterior end. The anterior end of each opens into the atrium. This opening is guarded by a circle of peculiar trifid spines with bifid roots or bases (Pl. 1, fig. 5). The three prongs of these spines are very minute.

The testes, approximately 34 in number, lie in the third quarter of the body length. They extend posteriorly somewhat beyond the anterior claspers. Their outlines are somewhat irregular. The slightly coiled vas deferens extends forward in the median line to the genital atrium. There is no cirrus.

The ovary lies near midbody just anterior to the testes. Beginning to the right of midline it extends laterally to the left of midline then coils forward for some distance to cross back to the right of midline whence it extends almost straight backward to near its origin. It is thus somewhat in the form of an inverted U. The shell gland surrounds the oviduct region. A gastro-intestinal canal and the common yolk duct join the oviduct. The uterus extends straight forward in the median line to the genital atrium. The vitellaria extend in the sides of the body from near the genital atrium to a short distance posterior to the testes. They are confluent behind the testes. The yolk ducts join near the anterior loop of the ovary to form a long common duct. Each yolk duct gives rise to a vagina near where the ducts unite. The two vaginae extend forward and unite at the vaginal pore. This vaginal pore is muscular, conspicuous but unarmed, median, dorsal, about halfway between the anterior ovarian loop and the anterior end of the body. Most specimens contain no eggs, but one had one egg, another six eggs in the uterus. The egg is ovoid, rounded anteriorly, more pointed posteriorly where it is extended into a long coiled polar filament. The eggs measure 122 to 133 by 61 to 65 microns. The polar filament may be very long, in one specimen extending coiled often upon itself, all the way from the atrial region to the ovary. It was probably 20 or more times the length of the egg.

Specific diagnosis of M. heteracantha. — Body slender, elongate, 5.194 to 8 by 0.262 to 0.502 mm. Claspers 200 to 250 in number, left row somewhat longer than the right. Skeleton of clasper of slender ribs, only the posterior of three lateral pairs meeting medianly. Each anterior sucker divided by a septum. Genital atrium with two pairs of conspicuous suckers, each anterior sucker divided into 7 loculi, the posterior pair in the form of undivided muscular sacs. Three distinct types of spines in genital atrium, a row of sickle-shaped spines in anterior sucker, a row of long slender spines near anterior sucker,

a ring of trifid spines around aperture of posterior sucker. Testes 33 to 35 in number in third fourth of body. Ovary inverted U-shaped. Vitellaria from region of atrium to slightly beyond testes. Vaginal pore dorsal, unarmed, about halfway between ovary and anterior end. Two vaginae unite at vaginal pore. Eggs 122 to 133 by 61 to 65 microns, with a long polar filament. Host: — *Cynoscion nebulosus.*

The name *heteracantha* refers to the differentiated spines of the genital atrium. The type specimen is deposited in the U. S. National Museum.

Comparison. — No other species of *Microcotyle* has such an elaborate genital apparatus accessory to the genital atrium. The four genital suckers there and the three types of hooks associated with them are characteristic. *M. sciaenae* Murray, 1931 has one pair rather than two pairs of genital suckers near the atrium. Furthermore, its body shape is different as is the shape of the ovary, the number of testes and arrangement of the claspers. Goto (1899 : 282) has described *M. longicauda* from *Cynoscion regalis.* In spite of the similarity of hosts, *M. longicauda* is very different in lacking the atrial suckers, in possessing but two (similar) types of genital hooks, in the shape of the ovary and posterior extent of the vitellaria. The slender skeletal pieces of the clasper of *M. heteracantha,* their size, and arrangement also seems to be different from other species of the genus.

Family *CALCEOSTOMIDAE*

Tricotyle scoliodoni n. g., n. sp.
(Pl. 2, figs. 1-4).

HOST: — *Scoliodon terrae-novae* (Richardson).
POSITION: — Gills.
NUMBER: — 8 specimens on one host.

Description: — The body measures 2.7 to 4.455 mm. in length and 0.750 to 0.985 mm. in greatest width, somewhat anterior to midbody. From this level the body gradually narrows to near the anterior end where from a slight constriction it flares out slightly ending bluntly. The posterior third to half of the body is about equally wide and is truncated at the posterior end where the small haptor is only slightly wider than the body. No eye spots are present.

The middle half to three-fourths of the anterior end is separated by narrow grooves from a lateral head lobe on each side (Pl. 2, fig. 2). These lobes are probably glandular. A ventral depression in the middle portion of the anterior end of the body, between the lobes, opens ventrally by a transverse aperture and contains two suckers or sucker-like structures. These suckers have well defined radial muscles and circular or subcircular apertures but are probably without outer membranes. Their greatest diameter is from 0.090 to 0.112 mm. The presence of paired suckers in Monogenea with glandular lobes is unusual and perhaps the sucker-like structures should not be interpreted as true suckers. There is some evidence that a knob-shaped median portion of the anterior end of the body is protrusible.

At the posterior end of the body is a peculiar sucker (0.480 to 0.570

mm. in diameter) slightly more than 1/2 the greatest diameter of the body but slightly wider than the posterior end. It is tripartite with a single large sucker-like portion directed ventrally or posteriorly and two small shallow cup-shaped structures on the dorsal side, one on each side of midline. The large sucker is surrounded by a membranous border and seems to be ribbed on its inner surface with approximately 75 thickenings which extend in an antero-posterior direction when the sucker is flattened (dorso-ventral if the sucker is directed posteriorly). These areas may represent the endings of numerous longitudinal muscles which extend up into the body. The sucker possesses a pair of fairly large, widely separated hooks and a number of smaller hooks near the periphery. These smaller hooks are either easily lost or often too inconspicuous to be seen. None were seen on one specimen, two on another, and six or seven on another. The large hooks (Pl. 2, fig. 4) have a heavy, truncated root and a short, tapering root and sharply curved blade. The greatest length (from curve of blade to base of root) is about 0.029 mm. and the point of the blade extends another 0.016 mm. Each small hook is straight and pointed with a forked base (Pl. 2, fig. 4). Its total length is only about 0.009 mm. The two dorsal suckers are shallow, saucer-shaped, seemingly non-muscular and without specialized structures.

The mouth is ventral a short distance posterior to the anterior suckers. Its posterior border is marked by a semicircular muscle. A fairly long pre-pharynx leads to the wide pyriform pharynx. The short more narrow anterior part of the pharynx possesses circular muscles. The larger posterior portion has wide muscular bands. The pharynx is slightly longer than wide measuring 0.195 to 0.300 by 0.190 to 0.232 mm. There is a very short esophagus. The ceca pass almost directly laterally to near the sides of the body, then turn posteriorly, arching slightly inward at the anterior end of the ovary, proceeding close to the testes to within a short distance of the posterior end where they end blindly. They are unbranched. The excretory vesicles can be seen opposite the pharynx.

The large, much branched, tubular ovary is located just anterior to midbody where it fills the intercecal space. Its anterior end is narrowed to a sinuous tube continuous with the oviduct. The uterus leads straight forward to the genital pore slightly to the left opposite the pharynx. Two small bulbous swellings occur at the base of the uterus (Pl. 2, fig. 3). No completely formed eggs were seen. The vitellaria extend from the base of the pharynx to near the posterior end of the body becoming confluent posterior to the testes. The yolk reservoir lies ventral to the oviduct. Numerous gland cells probably representing the shell gland fill the intercecal space immediately anterior to the ovary. The single vagina extends diagonally to the left from the oviduct then straight forward to the vaginal pore which lies somewhat to the left shortly posterior to the intestinal bifurcation. The terminal half or more of the vagina is very thick-walled and muscular and is surrounded by gland cells being thus very conspicuous (Pl. 2, fig. 3).

There are five testes, tandem, filling the intercecal area immediately posterior to the ovary but not extending far beyond midbody. The testes are lobed, often very irregular in shape, sometimes almost broken into follicles. The tubular seminal vesicle extends forward along the right side of the vagina to near the vaginal pore, then forms a backward loop returning to near the

intestinal bifurcation where it again turns posteriorly and enters the base of the cirrus sac. The combined cirrus and cirrus sac is flask-shaped, 0.485 to 0.645 mm. in length. The chitinous, tubular cirrus measures 0.262 to 0.300 mm. in length. Its distal tip is slightly curved and bears a small transparent flange on one side. The ovoid basal portion of the cirrus sac is largely filled with the pars prostatica but contains a pair of small transparent sacs in its base.

Generic diagnosis of Tricotyle. — Elongated, eyeless, medium-sized Monogenea, widest anterior to midbody. Anterior end with two lateral lobes and two submedian suckers. Posterior haptor weakly developed, slightly wider than posterior end of body, with a terminal or ventral undivided sucker-like disc without radii and two smaller dorsal saucer-shaped depressions; one pair of large hooks; several minute marginal spines. Mouth ventral; prepharynx present; pharynx with broad muscular bands; ceca unbranched, ending blindly near posterior end. Ovary tubular, branched; uterus straight; vagina single, muscular and glandular; vaginal pore ventral to left of midline; vitelline follicles in sides of body. Testes 5, irregular in outline, tandem, in midbody region; seminal vesicle tubular with two anterior loops; cirrus chitinous, tubular.

TYPE SPECIES: — *T. scoliodoni.*

The name *Tricotyle* refers to the three divisions of the posterior haptor. The type specimen is deposited in the U. S. National Museum.

Until other species are known the above diagnosis will serve also as specific diagnosis for *T. scoliodoni.*

DISCUSSION

The allocation of this genus is very difficult. It resembles *Calceostoma* van Ben., 1858 (family *Calceostomidae*) in its branched ovary, its posterior haptor and hooks, and in the male terminal organs, but differs in its anterior suckers, vagina, and number of testes. It resembles *Dionchotrema* Johnston & Tiegs, 1922 (which is classified in the subfamily *Dionchinae* J. & T., family *Calceostomidae*) in that both possess a vagina and the shell gland is somewhat similar, but the cirrus is different as well as the anterior suckers, lack of eye spots, form of pharynx, number of testes and shape of ovary. The anterior suckers would seem to exclude *Tricotyle* from the *Monocotylidae* yet it has characters suggesting *Anoplodiscus*, *Leptocotyle* and *Pseudocotyle*. Among the *Capsalidae (Tristomidae)* there seems to be no closely related genus. The genus *Loimos* MacCallum, 1917 from the gills of *Carcharhinus obscurus* is perhaps a related genus. It has no vagina, only two testes and the ovary is unbranched, yet it agrees with *Tricotyle* in having two somewhat connected anterior suckers and a similar posterior haptor with similar hooks. *Tricotyle* is tentatively considered in the *Calceostomidae.*

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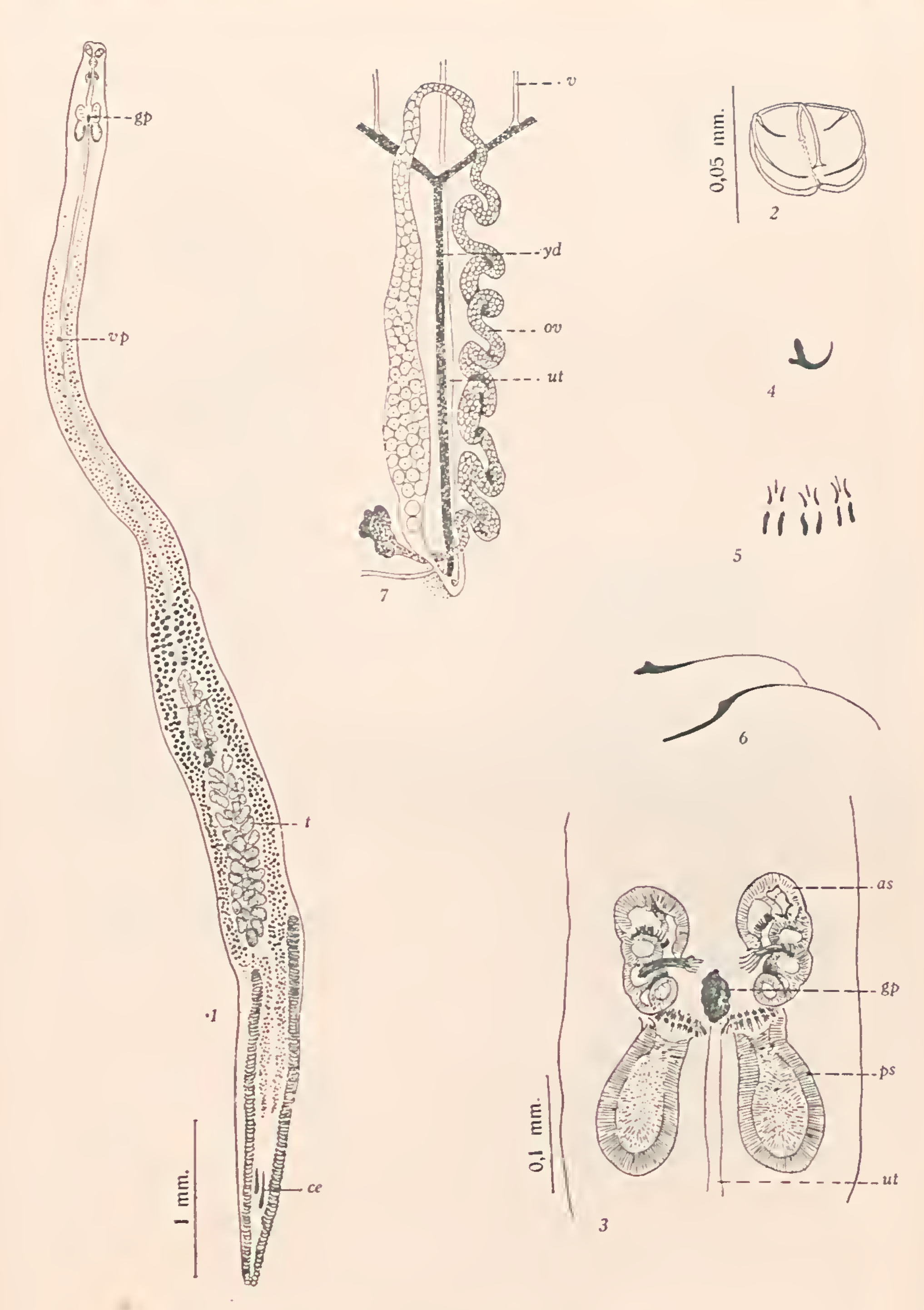
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Plate 1

Fig. 1 — *Microcotyle heteracantha*. Ventral view.
Fig. 2 — *M. heteracantha*. Clasper. Ventral view.
Fig. 3 — *M. heteracantha*. Genital atrium complex. Ventral view.
Fig. 4 — *M. heteracantha*. Hook from anterior atrial sucker.
Fig. 5 — *M. heteracantha*. Hooks from posterior atrial sucker.
Fig. 6 — *M. heteracantha*. Hooks from genital atrium.
Fig. 7. *M. heteracantha*. Diagram of female reproductive system.

All figures except the diagram (fig. 7) were made with the aid of a camera lucida.

Abbreviations: — *as*, anterior atrial sucker; *ce*, intestinal cecum; *gp*, genital pore; *ov*, ovary; *ps*, posterior atrial sucker; *t*, testis; *ut*, uterus; *v*, vagina; *vp*, vaginal pore; *yd*, yolk ducts.



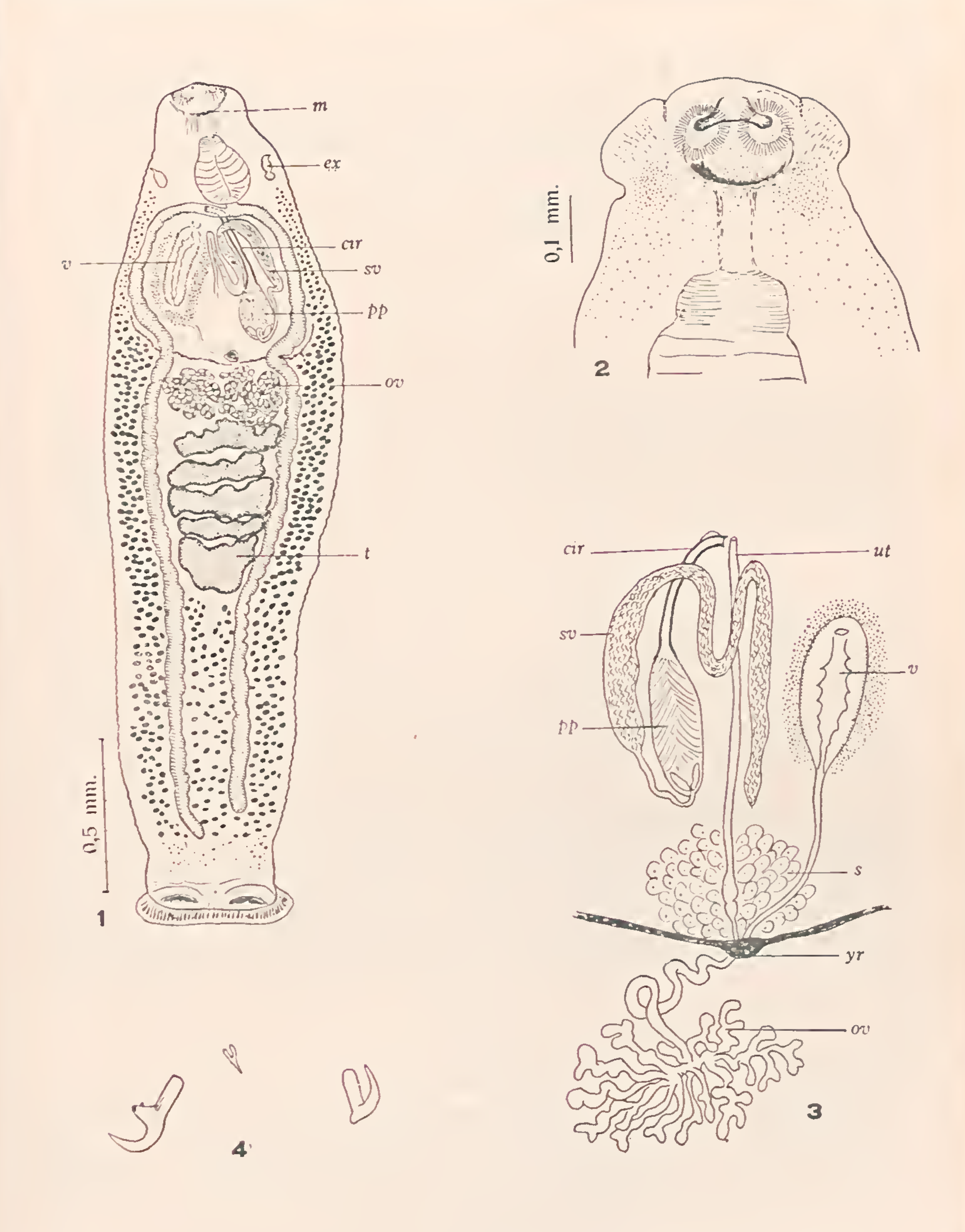
Manter: Two new monogenetic Trematodes.

Plate 2

Fig. 1 — *Tricotyle scoliodoni.* Dorsal view.
Fig. 2 — *T. scoliodoni.* Ventral view of anterior end.
Fig. 3 — *T. scoliodoni.* Diagram of reproductive organs.
Fig. 4 — *T. scoliodoni.* Two large hooks and one small hook from posterior haptor.

All figures except the diagram (fig. 3) were made with the aid of a camera lucida.

Abbreviations: — *cir*, cirrus; *ex*, excretory vesicle; *m*, mouth; *ov*, ovary; *pp*, pars prostatica; *s*, shell gland; *sv*, seminal vesicle; *t*, testis; *ut*, uterus; *v*, vagina; *yr*, yolk reservoir.



Manter: Two new monogenetic Trematodes.

Notes on the Morphology and Life Cycles of four North American Cercariae *

Donald B. McMullen

Monmouth College, Biology Department, Illinois — U. S. A.

[With 2 plates]

INTRODUCTION

In a series of experiments on the life cycles of various cercariae, extending over a period of seven summers, the author has found it impossible to obtain adults in all cases. It was thought advisable to report on the morphology and give certain notes on the life cycles of four of these species of cercariae, especially since one of the chief difficulties in working out the life cycles is the low incidence of these parasites in the region where this work was done. It may be that some one will find these species in other areas in sufficient quantity to continue the work on the life cycles.

The four cercariae were found in snails belonging to the genera *Stagnicola*, *Physella* and *Heliosoma* collected in region of the University of Michigan Biological Station. The Station is located in the northern tip of the southern peninsula of Michigan. It is situated on Douglas Lake and in the vicinity there are numerous lakes and streams, making an excellent habitat for a fauna of unusual variety. The snails were collected from Douglas Lake, Burt Lake, Black Lake and Lake Duncan. The latter is a lake on Bois Blanc Island in Lake Huron.

Three of the larval trematodes are *Xiphidiocercariae* and the fourth seems to be related to the *Psilostomidae*. With all of these species it was possible to infect second intermediate hosts and obtain metacercariae. It was possible, therefore, to observe the sporocysts or rediae, the cercariae and metacercariae of all four species. Metacercariae of the four species were fed to various vertebrates in an attempt to obtain adult trematodes. With one species very young trematodes were recovered from experimental definitive hosts but it has been impossible to complete the cycle.

METHODS

The snails were collected by the group in the laboratory, isolated in half pint milk bottles containing about 100 cc. of water, and examined for emerging cercariae. These examinations were usually made twice a day by holding the containers between the eyes and a light source. The snails that did not give off cercariae within 2-4 days were discarded.

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* A contribution from the University of Michigan Biological Station. The author wishes to express his appreciation to Dr. W. W. Cort for helpful suggestions.

Cercariae obtained in this way were examined carefully, while still free in the containers, for characteristic activities of the various species. Specimens were then removed and examined in the living condition under a compound microscope for the study of the minute morphological details. Intravitam stains were found to be of some use in the study of the stylet glands. It was impossible to get uniform measurements from living material so it was necessary to try various killing methods. With the *Xiphidiocercariae* solutions of formalin, hot corrosive sublimate and Bouin's fixing fluid gave distorted forms and the results were quite variable when analized statistically. Killing the *Xiphidiocercariae* with heat gave the most uniform measurements. With the psilostome cercaria five percent formalin gave the best results. These new species have been named in honor of four colleagues at the University of Michigan Biological Station, i. e., *Cercaria talboti*, *Cercaria herberi*, *Cercaria welleri* and *Cercaria thomasi*.

Experimental second intermediate hosts were either raised in the laboratory or were obtained from Vincent Lake, a mollusc-free lake in the vicinity. Animals used in the feeding experiments were either trematode-free laboratory animals or ones that had been kept in the laboratory for long periods before they were used.

OBSERVATIONS AND EXPERIMENTS

Cercaria talboti n. sp.

(Pl. 1, figs. 1-3).

Specific description: — Xiphidiocercariae; the body averages 0.190 × 0.078 mm. and is covered with cuticular spines (Pl. 1, fig. 1). The tail averages 0.178 × 0.026 mm. and also has small cuticular spines. The oral sucker is larger, 0.042 mm., than the acetabulum, 0.032 mm. in diameter. The digestive system consists of prepharynx, pharynx, esophagus and intestinal ceca that extend into the posterior part of the body. The stylet, measures 0.026-0.027 mm., has a long tapering point and heavy shoulders. There are three pairs of small stylet glands in the region just anterior to the acetabulum and there are three pairs of large glands lateral and posterior to the acetabulum. The excretory bladder is Y-shaped. It is impossible to determine the flame cell pattern but observed fragments indicate that it has the $2\ [(3+3+3)+(3+3+3)]$ arrangement. The cercaria is a good swimmer and maintains a high position in the water. When placed on a slide it crawls with a rapid, jerky movement.

Distribution. — Cercaria talboti has been found occasionally in *Stagnicola emarginata angulata* (Sowerby) from Burt Lake on the beach east of the mouth of Maple River and in *Stagnicola palustris etoides* (Say) from Black Lake in the swamp at the mouth of Black River.

Daughter sporocysts. — The sporocysts are elongate, irregular sacs (Pl. 1, fig. 2) averaging 0.795 × 0.188 mm. They are tightly packed with numerous germ balls and cercariae in various stages of development.

Metacercariae. — The cercariae were found to encyst in mosquito larvae, dragonfly and mayfly naiads. Cysts are slightly elongated and measure about 0.1 mm. Development of the metacercariae (Pl. 1, fig. 3) has been followed

for 13 days. The stylet glands disappear, the body clears and the excretory tubules can be seen. The flame cell pattern is 2 [(3 + 3 + 3) + (3 + 3 + 3)]. Developing testes may be seen diagonally placed in the region of the bladder. A cellular mass, probably the ovary is present between the arms of the bladder. Beginnings of the uterus and cirrus sac can be seen on opposite sides of the acetabulum.

Comparison with described Xiphidiocercariae. — This species is similar to *Cercaria burnupiae* Faust (1926) and other species placed in the « *cellulosa* » group in having the tail covered with small spines. The species mentioned above is nearer the size of *Cercaria talboti* than the other cercariae in this group. The excretory system of the « *cellulosa* » group is said to be simple, with a flame cell pattern of 2 [(2) + (2)]. The excretory system of *Cercaria talboti*, on the other hand is similar to that found in the « *polyadena* » group. The members of this group have been found to be the larvae of the *Plagiorchiidae* (Lühe).

Feeding experiments. — Metacercariae of *Cercaria talboti* were fed to *Ameiurus* sp., *Actitis macularia*, mouse, rat, domestic pigeon, duck and baby chicks. In some of the earlier experiments the cysts were fed too soon after encystment to expect the development of the adults. For that reason certain of these animals cannot be considered as valid negatives.

Cercaria herberi n. sp.

(Pl. 1, figs. 4-6).

Specific description: — *Xiphidiocercariae;* the body averages 0.208 × 0.094 mm. and is covered with small cuticular spines (Pl. 1, fig .4). The tail averages 0.140 × 0.027 mm. and has a finfold, about 0.008 mm. wide, running from about the middle of the ventral side, around the lip and a short distance along the dorsal side. The oral sucker is larger, 0.048 mm., than the acetabulum, 0.041 mm. in diameter. The digestive system consists of short prepharynx and esophagus, pharynx and intestinal ceca that can be followed into the region of the acetabulum. The stylet, measuring 0.034 mm., is thin walled and has long tapering shoulders. The stylet glands are composed of five lateral pairs and one median pair, the latter just anterior to the acetabulum. The excretory bladder is Y-shaped with a bulbous base and long arms extending into the region of the acetabulum. Only a few flame cells and tubules can be seen but the cercaria seems to have the 2 [(3 + 3 + 3) + (3 + 3 + 3)] pattern. The cercaria is a good swimmer.

Distribution. — *Cercaria herberi* has been found infrequently in *Physella magnalacustris* (Walker) from the beach west of Hook Point on Douglas Lake and once from the beach east of the mouth of Maple River on Burt Lake.

Daughter sporocysts. — The sporocysts are small rounded or elongate sacs measuring from about 0.25 mm. in diameter to 0.4 × 0.16 mm. (Pl. 1, fig. 5). They are tightly packed with developing cercariae and germ balls.

Metacercariae. — The cercariae were found to encyst in mosquito larvae and dragonfly naiads. The development of the metacercariae has been followed for 12 days. The cyst, thin walled and easily broken, measures 0.176 mm. in diameter. The encysted metacercaria (Pl. 1, fig. 6) shows considerable development and growth, 0.480 × 0.120 mm. The arms of the excretory bladder

are greatly elongated, extending into the mid-esophageal region. Cellular masses, believed to be developing testes and ovary are present, the former placed diagonally across the stem of the bladder and the latter is lateral to the median line and anterior to the bifurcation of the bladder. The prepharynx remains short but the esophagus is much longer than it was in the cercaria. The intestinal ceca extend into the posterior end of the body. Remnants of the stylet glands are still visible. The sucker ratio has changed, with the oral sucker increasing considerably in size. It is impossible to see all the details of the excretory system in the metacercaria but the parts seen indicate that the pattern is $2\ [(3+3+3)+(3+3+3)]$. The growth of the arms of the bladder produces some interesting changes. The main collecting tubules remain attached to the anterior end of the arms of the bladder but the point of junction of the anterior tubules remains relatively the same. To reach this position the main collecting tubule turns toward the median line, then posteriorly and laterally across the arm of the bladder where it divides into the posterior and anterior tubules.

Comparison with described Xiphidiocercariae. — The structure of this cercaria, and especially the changes that take place in the excretory bladder in the development of the metacercaria, indicates that this species is similar to those found in the genera belonging to the family *Haplometridae* McMullen (1937) for which several life cycles have been described (von Linstow, 1890; Krull, 1931, 1932, 1933; Ingles, 1933; Sinitsin, 1907; Van Theil, 1930; Macy, 1934). The adults of the members of the family, as far as known, are parasitic in the lungs of Amphibia (*Haplometrinae* Pratt) and the reproductive tracts of birds (*Prosthogoniminae* Lühe).

The observation of the origin of the main collecting tubule does not agree with that given by Ingles, i. e., lateral to the bladder arm in the region of the acetabulum. It is quite possible that the tubules do arise laterally, as he has described, but it should be said that in *Cercaria herberi* the same was believed to be true because the loop of the main tubule crosses the arm of the bladder and the rest of the collecting tubule is difficult to see. It was only occasionally that the actual origin could be seen. *Cercaria herberi* differs from the other described species of this family in having a stylet that is nearly twice as long and the suckers are more nearly the same size.

Feeding experiments. — Metacercariae of *Cercaria herberi* were fed to *Chrysemys* sp., *Triturus* sp., *Rana pipiens*, *Lepomis pallidus*, *Salvelinus fontinalis*, *Ameiurus* sp., *Perca flavescens* and domestic pigeon. In all of the experiments, except with the pigeon, the cysts were probably fed too soon after encystment to expect the development of adults.

Cercaria welleri n. sp.

(Pl. 2, figs. 1-5).

Specific description: — *Xiphidiocercariae;* the body averages 0.561 × 0.185 mm., is filled with numerous opaque granules and is covered with cuticular spines (Pl. 2, fig. 1). The tail averages 0.157 × 0.054 mm. The oral sucker is larger, 0.093 mm., than the acetabulum, 0.074 mm. in diameter. The digestive system consists of short prepharynx and esophagus, pharynx and intestinal ceca, filled with dark granules and extending into the posterior end. The stylet,

measuring 0.022-0.023 mm., is thin walled and has minute shoulders back of the point. The stylet glands cannot be seen but bundles of ducts are present lateral to the oral sucker. The excretory bladder is I-shaped, composed of an elongated anterior portion and a rounded bulb-like posterior portion. The anterior and posterior collecting tubules can be seen but it is impossible to make out the details of the system. The cercaria is a poor swimmer. It assumes a characteristic U-shaped position (Pl. 2, fig. 2) in the water and gradually settles to the bottom where it remains for a short time before swimming up into the water again, a few inches above the bottom.

Distribution. — *Cercaria welleri* has been found in two collections of *Heliosoma antrosa* (Conrad) from Maple River Cove in Douglas Lake.

Daughter sporocysts. — The sporocysts are elongate sacs, averaging 1.8 × 0.22 mm., with numerous germ balls and developing cercariae (Pl. 2, fig. 3).

Metacercariae. — It was found that the cercariae of *Cercaria welleri* are carried passively into the mouth of tadpoles by the respiratory currents. Upon examination the tadpoles had large numbers of shiny white cysts in the gill chambers (Pl. 2, fig. 4). The development of these metacercariae has been followed for 21 days. During this time there is some growth, 0.27 mm. in diameter, and the host develops a heavy cyst wall around the original one produced by the metacercaria. At the end of three weeks the anlagen of the testes and cirrus can be seen (Pl. 2, fig. 5). With the development of the metacercaria the body clears up somewhat and some of the details, not visible in the cercaria, can be seen. There are 20-21 pairs of ducts opening along the anterior border of the oral sucker. Complete details of the excretory system cannot be made out but 22 pairs of flame cell have been seen. The anterior group of flame cells seems to have three cells but it is evident that the pattern is not like that found in the species described above.

Comparison with described Xiphidiocercariae. — *Cercaria welleri* has an excretory system that suggests the type found in the *Allocreadiidae*. It is quite possible that it is the larval stage of some adult trematode now classified in that family. The fact that excystment takes place in intestine of fish adds credence to the idea that the adult of this species of cercaria is an allocreadid-like member of the *Plagiorchioidea*. The exact classification of the cercaria itself, except that it is a *Xiphidiocercaria*, has not been determined. The completion of this life cycle would be of great taxonomic importance.

Feeding experiments. — Metacercariae of *Cercaria welleri* were fed to mouse, baby chicks, *Chelydra* sp., *Chrysemys* sp., *Natrix* sp., *Esox lucius*, *Amia calva*, *Micropterus dolomieu* and *Ameiurus* sp. In all experiments except with *Natrix* the metacercariae were two or more weeks old. Excysted metacercariae were found in the intestine of *Micropterus dolomieu* and *Ameiurus* 6-30 hours after feeding. Fish left for longer periods were negative.

Cercaria thomasi n. sp.

(Pl. 2, figs. 6-9).

Specific description: — *Gymnocephalus* cercariae; the body is quite active and in crawling movements there is a separation into anterior and posterior portions of the body by a constriction posterior to the acetabulum (Pl. 2, fig. 6).

When relaxed the body is oval in shape, measuring 0.470 × 0.192 mm. The cuticle is thick but no spines were seen. The tail, fully extended, measures 0.800×0.048 mm. The oral sucker is elongate, 0.045×0.082 mm. Just posterior to the oral sucker there is a region that has a pale pink coloration. The acetabulum is elliptical, 0.101 × 0.071 mm., and has a fringe of thin, scalloped tissue around the periphery. In killed specimens the acetabulum is round, measuring 0.096 mm. in diameter, and a short stalk is plainly visible (Pl. 2, fig. 7). The digestive system is composed of prepharynx and pharynx with a visible lumen. The esophagus and intestinal ceca are outlined by a single row of large granular cells. Just posterior to the pharynx three pairs of these cells make lateral projections of the esophagus. The excretory bladder is composed of a large posterior chamber and a short bulbular or tubular anterior portion. The position of the excretory opening was not determined. The anterior portion of the bladder gives off main collecting tubules, which extend laterally then run anteriorly to the region of the oral sucker where they turn, give off branches to the flame cells and extend into the posterior end of the body. The anterior portion of the descending tubule is broad, convoluted and filled with large refractile granules. At the level of the prepharynx this tubule gives off a lateral branch that extends anteriorly for a short distance before turning toward the posterior end as the ascending tubule. The exact pattern of the flame cells has not been determined but there are at least 24 pairs and in some specimens it was believed that as many as 27 pairs could be seen. The cercaria is a strong swimmer and is in constant movement, as in the echinostomes. When mounted on a slide they are active crawlers and the stalked condition of the acetabulum is plainly visible.

Distribution. — This cercaria was obtained in three collections of *Heliosoma antrosa* (Conrad), from Lake Duncan on Bois Blanc Island, the north shore of Black Lake and Hook Point Cove in Douglas Lake.

Rediae. — The rediae are elongate, averaging 0.85 × 0.17 mm., with a well defined pharynx and short cecum (Pl. 2, fig. 8). Near the posterior end the locomotor organs can be seen as two small lateral papillae. Details of the flame cell pattern could not be seen but there are two lateral groups of the cells in the second quarter of the body. Each group contains 18-24 flame cells and their ducts lead into two collecting tubules that extend posteriorly and join in the third quarter of the body. The common duct can be followed into the region of the lateral papillae but its termination was not seen.

Metacercariae. — These cercariae were found to encyst in bullheads *(Ameiurus).* No penetration was observed but the cercariae were swept into the mouth by the respiratory movements and the cercariae failed to come out of the gill openings. The poorly developed. thin walled cyst is quite elongate (Pl. 2, fig. 9) and the metacercaria does not fill the cavity completely. The development was followed for 12-15 days. The excysted metacercaria, partially flattened, measures about 0.580 mm. in length. The body is covered with well developed spines. The esophagus and intestinal ceca have become tubular organs, filled with large vacuoles and the anlagen of the reproductive organs were not seen.

Comparison with described cercariae. — This cercaria is similar to *Cercaria Psilotrema spiculigerum* (Mathias, 1925), *Cercaria fusiformis* O'Roke (1917), *Cercaria penthesilia* Faust (1921), *Cercaria semirobusta* Faust (1924), *Cercaria reflexa*

Cort (1915), *Cercaria Indicae XLI* Sewell (1922) and *Cercaria grandis* Wesenberg-Lund (1934). *Cercaria thomasi* differs from all the other species in the shape of the excretory bladder, in having a pigmented area posterior to the oral sucker and in measurements of the body and suckers. The sucker ratio is most like that of *Cercaria grandis*. Instead of encysting on submerged vegetation, as *Cercaria Psilotrema spiculigerum*, this species will encyst in fish. The characteristics of the known stages of *Cercaria thomasi* indicate that the adult is probably a member of the *Psilostomidae* and parasitic in a fish eating bird.

Feeding experiments. — By the time a suitable intermediate host had been found very few cercariae remained in the infected snails. The available metacercariae were fed to a domestic pigeon, which was negative when examined.

SUMMARY

The cercariae, final larval stages in the molluscan hosts and metacercariae of four species of trematodes have been described and compared with related species. Three of these species are members of the *Plagiorchioidea* (Dollfus) and the fourth is probably a member of the *Psilostomidae* Odhner.

1. *Cercaria talboti*, a *Xiphidiocercaria* of the « *polyadena* » group, was found developing in *Stagnicola emarginata angulata* and *Stagnicola palustris eloides*. Various insect naiads have been found to serve as intermediate hosts.

2. *Cercaria herberi*, a *Xiphidiocercaria*, was found developing in *Physella magnalacustris*. Mosquito larvae and dragonfly naiads have been found to serve as intermediate hosts. The development of the metacercaria indicates that this species belongs to the *Haplometridae* McMullen.

3. *Cercaria welleri*, a *Xiphidiocercaria*, was found developing in *Heliosoma antrosa*. Tadpoles have been found to serve as second intermediate hosts. Excystment has been obtained by feeding the metacercariae to fish.

4. *Cercaria thomasi*, a *Gymnocephalus* cercaria, was found developing in *Heliosoma antrosa*. Encystment and the development of the metacercariae has been obtained in bullheads *(Ameiurus)*.

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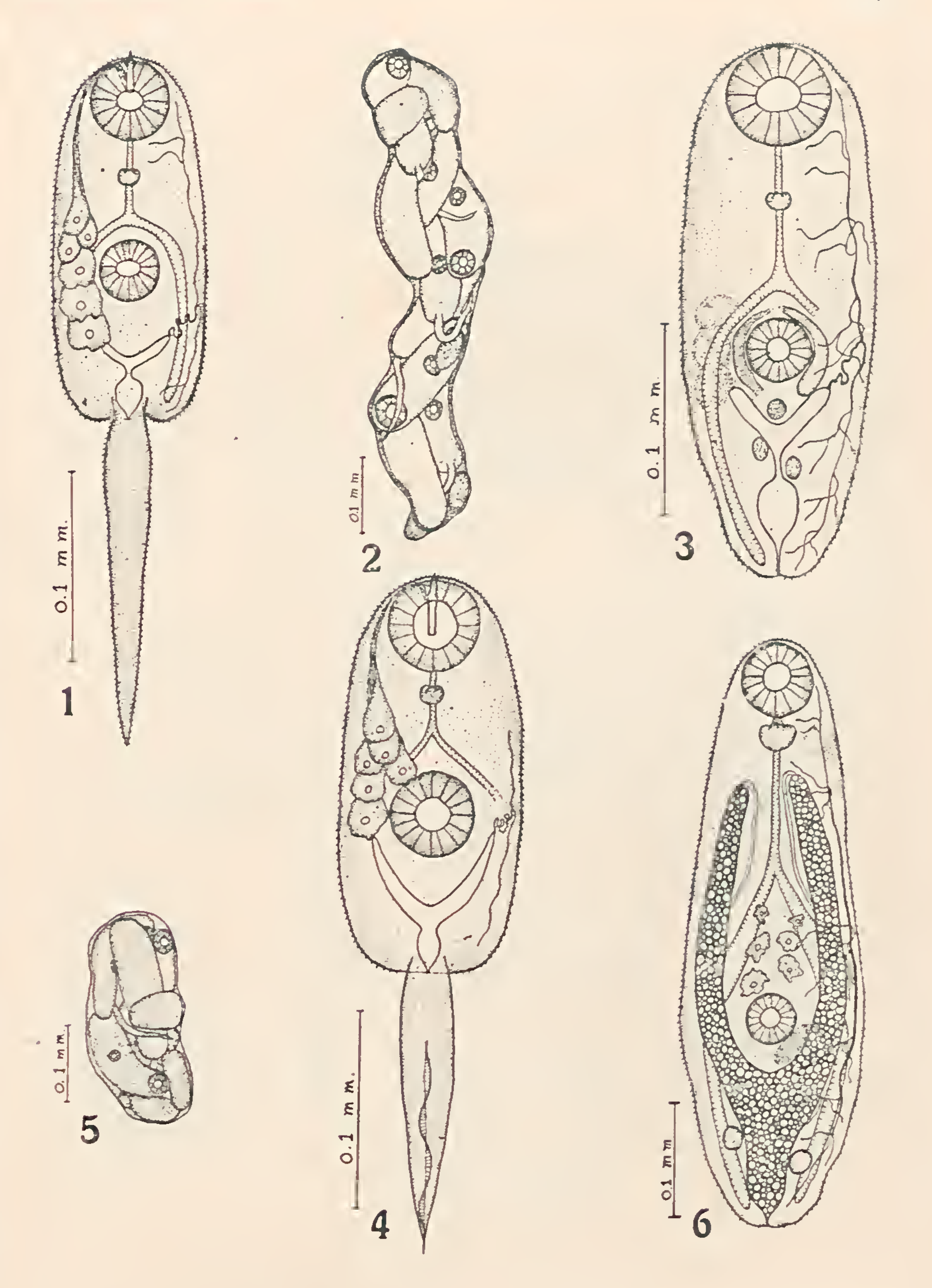
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Plate 1

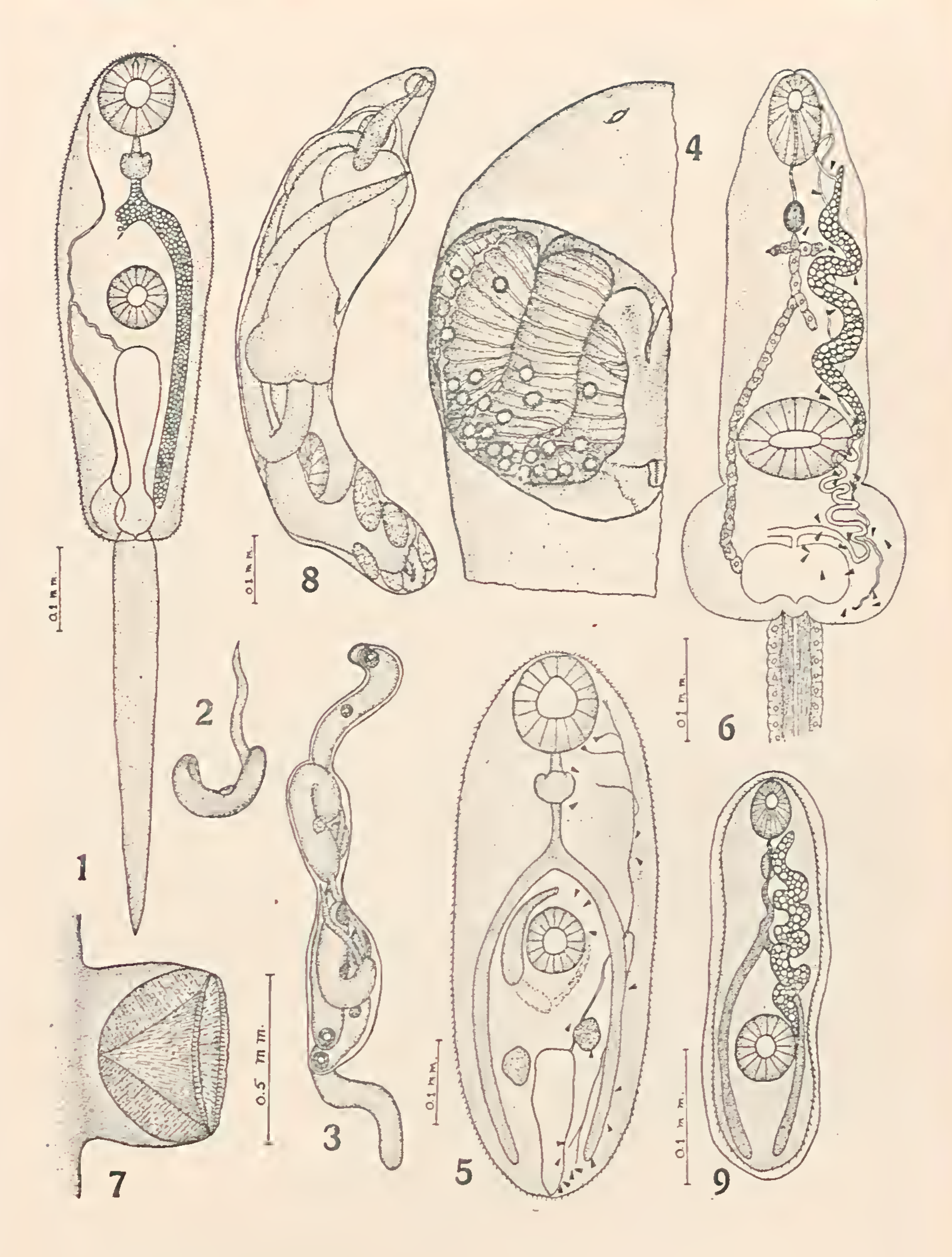
Fig. 1 — *Cercaria talboti.*
Fig. 2 — Sporocyst of *Cercaria talboti.*
Fig. 3 — Metacercaria, 13 days old, of *Cercaria talboti* from dragonfly naiad.
Fig. 4 — *Cercaria herberi.*
Fig. 5 — Sporocyst of *Cercaria herberi.*
Fig. 6 — Metacercaria, 7-8 days old, of *Cercaria herberi* from dragonfly naiad



Mc Mullen: North American Cercariae.

Plate 2

Fig. 1 — *Cercaria welleri.*
Fig. 2 — Typical resting position taken by *Cercaria welleri.*
Fig. 3 — Sporocyst of *Cercaria welleri.*
Fig. 4 — Cysts of *Cercaria welleri* in gill chamber of a tadpole.
Fig. 5 — Metacercaria, 21 days old, of *Cercaria welleri* from a tadpole.
Fig. 6 — *Cercaria thomasi.*
Fig. 7 — Lateral view of the acetabulum of *Cercaria thomasi.*
Fig. 8 — Redia of *Cercaria thomasi.*
Fig. 9 — Metacercaria, 15 days old, of *Cercaria thomasi* from bullhead.



Mc Mullen: North American Cercariae.

Two New Distomes of the Subfamily Stomylotreminae Travassos, 1922

(Family Lepodermatidae Odhner)

H. R. Mehra, M. Sc., Ph. D. (Cantab.)
Zoology Department, University of Allahabad — India

[With 3 text-figs.]

While dealing with the classification of the family *Lepodermatidae* in a recent paper (1937) it was suggested by me that the family *Stomylotrematidae* Poche, 1925 should be reduced to the rank of a subfamily as created by Travassos (1922) within the *Lepodermatidae*. This question was, however, left undecided till I thought I had the opportunity of studying forms belonging to this subfamily. In the present paper are described two new species, one belonging to the genus *Stomylotrema* Looss, 1900 (syn. *Stomylus* Looss, 1899) and another to the genus *Laterotrema* Semenov, 1928, the only two genera which have so far been assigned to the *Stomylotrematidae*. These genera are parasitc in birds, and though on the whole poorly recorded, have a wide geographical distribution extending over central and eastern Europe, India and North and South Americas.

The systematic position of *Stomylotrema* was little discussed by Looss, who considered it so isolated that he was unable to find its relationships. Lühe (1909) did not assign it to any family or subfamily. Nicoll (1923) included it with *Prosthogonimus* and *Schistogonimus* in his family *Cephalogonimidae* without any comment. Travassos (1922) created for it the subfamily *Stomylotreminae*, which Viana (1924) following Travassos included under the *Plagiorchidae* (syn. *Lepodermatidae*) in his systematic index of the Trematodes of Brazil. Poche (1925) considered it to be so different from all the families known till then that he created for it a new family *Stomylotrematidae*. The genus *Laterotrema* was assigned by Semenov, who created it in 1928 for *Distomum vexans* Braun, 1901, to the family *Cephalogonimidae* as understood by Nicoll, along with the genera *Cephalogonimus*, *Schistogonimus*, *Prosthogonimas* and *Stomylotrema*. McIntosh (1936) described second species, *Laterotrema americana* and included it under the *Stomylotrematidae*. From my study of the two new species described here I am convinced that *Stomylotrema* and *Laterotrema* bear sufficiently close resemblance to the *Lepodermatidae* so as to be included in it under the subfamily *Stomylotreminae* Travassos, 1922, which appears to be closely related to the subfamilies *Cephalogoniminae* Looss, 1899 and *Prosthogoniminae* Lühe, 1909.

Stomylotrema travassosi sp. n.

(Fig. 1).

HOST: — *Artamus fuscus*.
POSITION: — Cloaca.

FREQUENCY: — Present in one out of six hosts examined.
LOCALITY: — Allahabad, U. P. (India).

Only one specimen of this parasite was obtained from the cloaca of one out of six Ashy Swallow-Shrike, *Artamus fuscus* examined at Allahabad. Body thick, strongly muscular, egg-shaped, rounded at both ends, hinder end broader. Length 2.15 mm., greatest breadth 1.53 mm. across anterior margin of ventral sucker. Cuticle smooth, without spines. Suckers rounded, very large and nearly equal with circular opening; oral sucker subterminal, ventral, more muscular, 0.864 mm. in diameter; ventral sucker post-equatorial, at a little more than width of its posterior margin, i. e., 0.24 mm. in front of hinder end, 0.88 mm. × 0.864 mm. in size. Prepharynx absent; pharynx large, 0.272 mm. × 0.24 mm., overlapped anteriorly a little by oral sucker; oesophagus absent; intestinal caeca diverge outwards as they arise passing a little forwards in the region of oral sucker close to its posterior wall and then bend to continue their downward course near body wall, terminating near hinder end. Genital opening ventral on right body margin in the region of oral sucker at about middle of its length, 0.54 mm. behind anterior end, sucker-shaped with muscular walls; diameter of genital sucker 0.204 mm.

Testes asymmetrical, slightly oblique, lateral and far apart from one another with their zones partly coinciding, immediately in front of ventral sucker; anterior testis dextral near body margin, equatorial near and outside basal part of cirrus sac, rounded, 0.272 mm. in diameter; posterior testis sinistral near median line just behind middle of body, 1.36 mm. behind anterior end and 0.93 mm. in front of hinder end, ovoid, broader than long, 0.272 mm. in length and 0.336 mm. in maximum breadth. Cirrus sac elongated and somewhat pear-shaped, broader at the base, narrow and tubular near terminal end where it is slightly constricted, nearly straight at its inner and convex at outer margins and obliquely directed with its base approaching median line, 0.8 mm. in length and 0.19 mm. in maximum breadth at a little above its base. Vesicula seminalis coiled in small basal part of cirrus sac; pars prostatica long, tubular, 0.426 mm. in length; prostate gland cells numerous filling all available space in cirrus sac; ductus ejaculatorius (cirrus) small, 0.17 mm. long.

Ovary pre-testicular, pre-equatorial, opposite to genital pore side and much behind genital pore, in front of and in same line with posterior testis opposite to basal end of cirrus sac, 1.07 mm. behind anterior end, rounded, smaller than testes, nearly equal to pharynx in size, i. e., 0.21 mm. × 0.23 mm. Receptaculum seminis absent; Laurer's canal not observed. Uterine coils intracaecal and overlapping caeca surrounding ventral sucker, mostly lateral and to left side, extending anteriorly in front of pharynx to hinder one third of oral sucker; terminal part of uterus nearly straight, inside and parallel to cirrus sac. Vitellaria composed of discrete oval or elliptical follicles of large size arranged in a longitudinal row, commencing from just in front of anterior testis or a little in front of middle of cirrus sac on the genital pore side and from the middle of ovary in level with the base of cirrus sac on the opposite side to about middle of ventral sucker or a little behind it respectively; vitelline gland of genital pore side composed of 6 follicles overlapping right caecum near right body margin; vitelline gland of left side composed of 9

follicles situated much inwards near median line overlapping posterior testis. Ova golden brown, oval, 0.024-0.03 mm. in length and 0.018-0.021 mm. in maximum breadth.

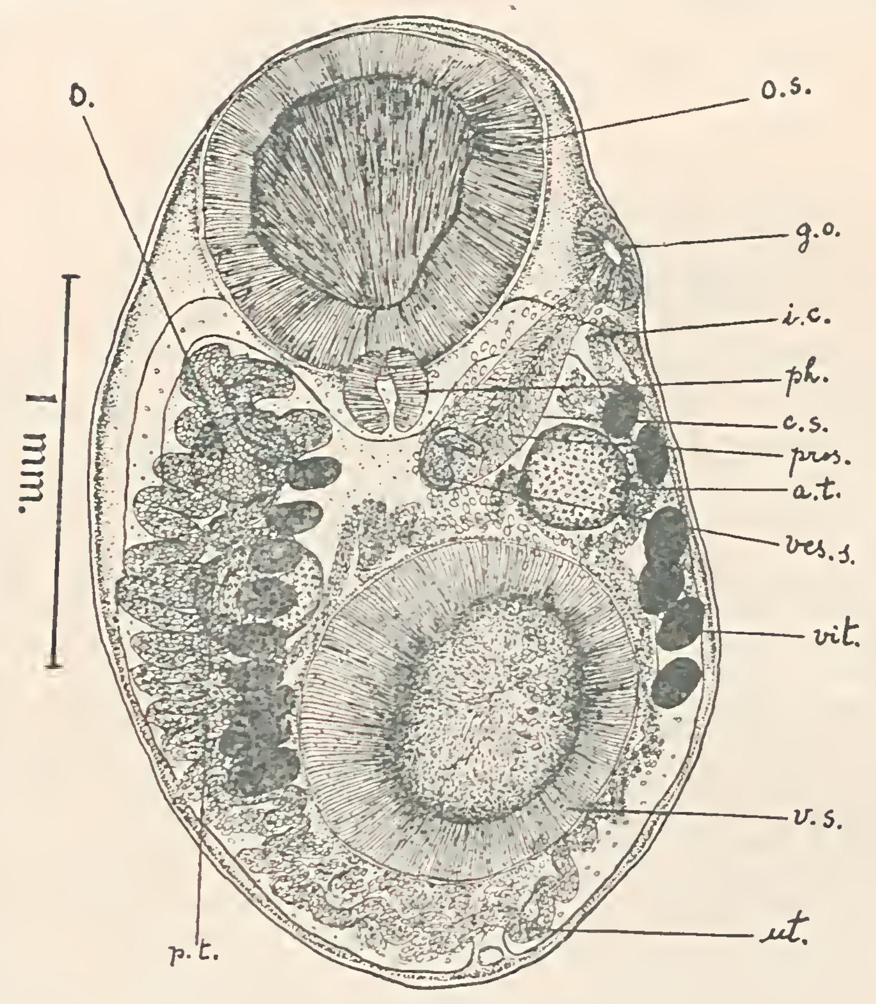


Fig. 1 — Dorsal view of *Stomylotrema travassosi* sp. n.

Remarks: — This species differs from all the species of the genus known so far in the number of vitelline follicles of the genital pore side being 6, in the large size and shape of the cirrus sac and in the slightly oblique position of the testes. It stands nearest to *Stomylotrema gratiosus* Travassos, 1922 on account of similarity in size of the body and suckers, position of the genital opening and ovary, oblique position of the cirrus sac and size of the ova, but it differs in addition to the distinctive features mentioned above in the vitelline follicles being situated more inwards i. e., inside or on the caeca (in *Stom. gratiosus* vitelline follicles are extra-caecal), in approximately equal

size of the suckers, anterior limit of the vitellaria and the intestinal caeca being not curved in the region of the testes. It also bears some resemblance to *Stom. fugax* Braun, 1901 in the position of the genital opening and the ovary, oval form of the vitelline follicles and posterior limit of the vitellaria, but it differs from it in almost all other important features.

Laterotrema indiana sp. n.

(Figs. 2 and 3).

HOST: — *Dicrurus macrocercus macrocercus.*
POSITION: — Bursa Fabricii and cloaca.
FREQUENCY: — Present in one out of four hosts examined.
LOCALITY: — Vicinity of Allahabad.

Sixteen specimens of this trematode were obtained from the cloaca and bursa Fabricii of one out of four birds of the species *Dicrurus macrocercus macrocercus* shot in the vicinity of Allahabad. Body thick, strongly muscular, oval or egg-shaped, rounded at ends hinder end being broader, 1.37-1.8 mm. long by 0.88-0.93 mm. in greatest breadth across middle or a little in front of acetabulum. Cuticle covered with backwardly directed spines, which are more numerous and larger in front of genital opening, sparse behind acetabulum and practically absent at extreme anterior and posterior ends; spines on dorsal surface small. Suckers rounded, very large; oral sucker subterminal, slightly larger and more muscular, 0.37-0.4 mm. in diameter; acetabulum slightly postequatorial, 0.4-0.5 mm. in front of hinder end, 0.3-0.32 mm. in diameter. Prepharynx absent; pharynx large, 0.08-0.11 mm. long by 0.14-0.16 mm. broad overlapped a little by oral sucker, esophagus absent; intestinal caeca diverge a little forwards and outwards at their origin and then bend backwards passing laterally outside acetabulum and testes sometimes overlapping the latter, broad and undulating with their ends usually directed mediad, terminating near or a little in front of hinder end. Testes lateral and almost post-equatorial, 0.096-0.24 mm. apart, immediately behind acetabulum or partly lateral to it symmetrically opposite or the right a little in advance of the left, usually with entire margins, rarely lobed or with irregular outer margin, unequal, 0.25-0.32 mm. long by 0.176-0.24 mm. broad. Cirrus sac well developed, muscular, obliquely situated to right side ventral to right intestinal caecum with its basal end reaching a little in front of acetabulum near median line, usually slightly curved or semilunar with the concavity directed outwards, 0.34-0.48 mm. long by 0.12-0.126 mm. in maximum breadth near base; in one specimen basal end of cirrus sac was directed anteriorly towards intestinal bifurcation and the concavity faced forwards. Vesicula seminalis coiled in basal part of cirrus sac; pars prostatica tubular near one side; prostate gland cells well developed; cirrus well developed, protruded in all specimens, strong, cylindrical, arched in front, broad near the base where it is constricted off from cirrus sac, 0.25-0.41 mm. long and 0.1-0.11 mm. broad near the base and 0.063-0.075 mm. broad at the tip (in one contracted specimen 0.16 mm. long and 0.11 mm. broad at a little above the base). Genital opening marginal at right body margin, in level with pharynx or a little behind it or even a little behind intestinal bifurcation, 0.35-0.5 mm. distance from anterior end depending upon state of contraction of the distome.

Ovary nearly rounded or oval, pre-equatorial, pre-acetabular, close to or a little behind intestinal bifurcation, to left side close inside left caecum opposite basal end of cirrus sac, smaller than testes, 0.16-0.176 mm. in diameter.

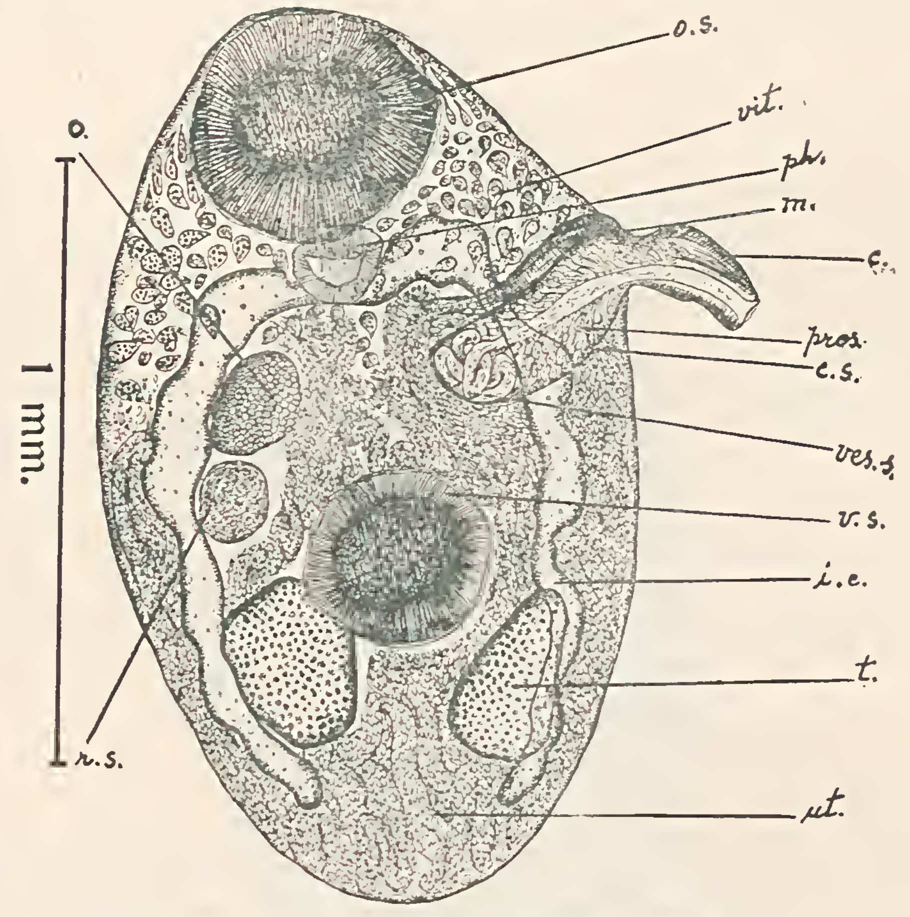


Fig. 2 — Dorsal view of *Laterotrema indiana* sp. n.

Receptaculum seminis well developed, smaller than ovary and situated immediately behind it, 0.096-0.135 mm. long by 0.075-0.114 mm. broad; Laurer's canal present. Vitellaria composed of moderately sized follicles, situated dorsally near body wall outside and overlapping caeca, running mesially and uniting with one another extending from middle of oral sucker to hinder margin of ovary or anterior margin of acetabulum. Uterus much convoluted, intracaecal and extracaecal, passing between and surrounding testes, reaching hinder end and filling all the available space behind ovary; metraterm well developed and lined internally with chitin, 0.36 mm. long by 0.015-0.06 mm. broad, opening to the exterior at genital pore dorsally to the opening of cirrus sac. Ova oval, yellow brown, 0.021-0.03 mm. by 0.012-0.015 mm. in size.

Remarks: — The new species differs from the two already known species, *Laterotrema vexans* (Braun, 1901) Semenov, 1928 and *L. americana* McIntosh, 1936 in the shape of its body and post-equatorial position of the acetabulum, which lies far behind the oral sucker, reverse to that in *L. vexans*. It is also distinguished by the post-equatorial position of the testes, size and shape of the cirrus sac and presence of a strongly developed muscular cirrus which

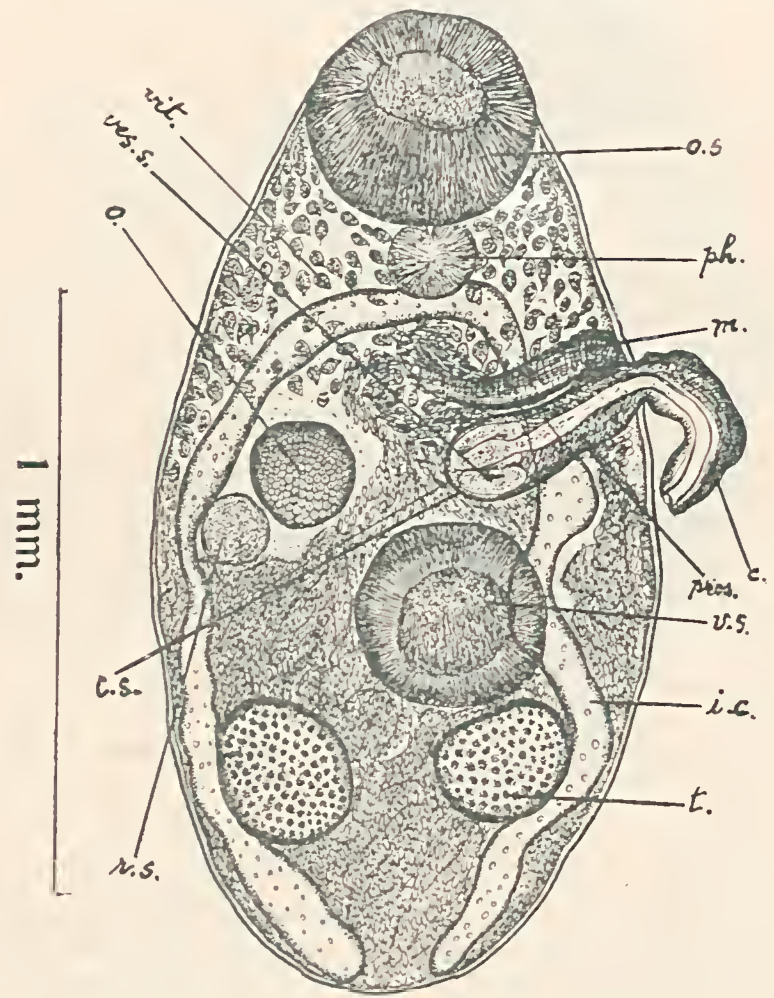


Fig. 3 — Dorsal view of *Laterotrema indiana* sp. n.

lies always protruded. It stands, however, closer to *L. americana* on account of the greater separation of the suckers and relative position of the testes and ovary, but it differs in, besides the features mentioned above, the testes being larger than the ovary and the mesial extension of the vitellaria, — a feature in which it resembles *L. vexans*. The last named species also differs remarkably in the entire absence of spines.

In view of the descriptions of the American and Indian species the diagnosis of the genus *Laterotrema* as given by Semenov based only on the account of the type species, *L. vexans* needs modification. The emended diagnosis is as follows: —

Laterotrema Semenov, 1928.

Lepodermatidae Odhner, 1911; *Stomylotreminae* Travassos, 1922. Body small, fairly thick and muscular, oval or linguiform or pointed behind. Cuticle with or without spines. Suckers very large, nearly equal; acetabulum pre-equatorial or post-equatorial. Prepharynx absent; pharynx large; oesophagus absent or very small; intestinal caeca diverging a little forwards and outwards at their origin, usually broad and undulating, terminating behind testes near or a little in front of hinder end. Genital opening lateral and marginal on right (or left?) body margin near pharynx or intestinal bifurcation. Testes lateral, symmetrical, almost symmetrical or oblique, oval with entire margins or slightly lobed, unequal, pre-equatorial, near posterior margin of acetabulum or post-equatorial just behind acetabulum. Cirrus sac well developed, opposite ovary, obliquely or at right angles to long axis of body. Vesicula seminalis coiled in basal part of cirrus sac; pars prostatica tubular; prostate gland cells well developed; cirrus strongly developed, always protruded in *L. indiana*. Ovary pre-testicular, approximately rounded, oval or elliptical, opposite genital opening. Receptaculum seminis well developed. Vitellaria composed of many comparatively large or moderate sized follicles usually situated transversely near dorsal body surface between suckers or arranged laterally from zone of oral sucker to middle of acetabular zone. Uterus much coiled; metraterm well developed. Ova oval, yellow brown or lemon-yellow, 0.024-0.033 × 0.012-0.02 mm. Parasitic in bursa Fabricii and cloaca of birds.

TYPE SPECIES: — *Laterotrema vexans* (Braun, 1901).

Stomylotreminae Travassos, 1922.

Subfamily diagnosis. — *Lepodermatidae:* Suckers very large, strongly muscular; acetabulum usually post-equatorial, rarely pre-equatorial. Prepharynx absent; pharynx large; oesophagus absent or very small; intestinal caeca diverging outwards and forwards at their origin, terminating behind testes near or some distance in front of hinder end. Genital opening ventral near right body margin or marginal on right (or left?) body margin in the zone of oral sucker, near pharynx or near intestinal bifurcation. Testes symmetrical, nearly symmetrical or oblique, pre-equatorial or post-equatorial. Cirrus sac well developed, opposite ovary, obliquely or at right angles to long axis of body. Vesicula seminalis coiled in basal part of cirrus sac; pars prostatica and cirrus well developed. Ovary pre-testicular, sinistral, opposite genital opening. Receptaculum seminis and Laurer's canal present. Vitellaria lateral composed of a few large or many moderate sized follicles, united transversely with one another in two species of *Laterotrema*. Uterus much coiled, reaching near hinder end. Ova numerous, small, oval or elliptical, 0.0228-0.033 mm. long by 0.011-0.02 mm. broad. Parasitic in bursa Fabricii and cloaca of birds.

TYPE GENUS: — *Stomylotrema* Looss, 1900.

KEY TO THE GENERA OF THE SUBFAMILY *STOMYLOTREMINAE*

Genital opening ventral near right body margin; vitellaria composed of a few large discrete follicles *Stomylotrema* Looss, 1900.

Genital opening marginal on right body margin; vitellaria composed of many moderate sized follicles *Laterotrema* Semenov, 1928.

Lettering to Figs. 1-3: — a. t. anterior testis; c. cirrus; c. s. cirrus sac; g. o. genital opening; i. c. intestinal caecum; m. metraterm; o. ovary; o. s, oral sucker; ph. pharynx; pros. prostate gland cells; p. t. posterior testis; r. s. receptaculum seminis; t. testis; ut. uterus; v. s. ventral sucker; ves. s. vesicula seminalis; vit. vitellaria.

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Uma nova especie de Desmiphora Serv., 1835

(Col. Cerambycidae)

Dario Mendes

Secção de Entomologia, Instituto de Biologia Vegetal, Rio de Janeiro — Brasil

[Com 1 estampa]

Em Setembro de 1934 fiz uma excursão entomologica, em companhia do Prof. Dr. Lauro Travassos, a Jussaral (perto de Angra dos Reis, Estado do Rio), situada na Serra do Mar a uma altitude de 350 metros. Entre o material de coleopteros colligido naquella occasião encontrei um bello longicorneo pertencente ao genero *Desmiphora* Serv., e que me parece representar uma especie nova para a sciencia.

O genero *Desmiphora* é exclusivamente neotropico. Aurivillius (1921, Col. Cat. Pars 73) enumera apenas 18 especies. No emtanto, o numero total das especies actualmente conhecidas é de 23, as quaes constam da seguinte lista:

1. *D. aegrota* Bates, 1880. — Guatemala.
2. *D. canescens* Bates, 1874. — Nicaragua.
3. *D. cirrosa* Erichson, 1847. — Amazonas até Mexico.
4. *D. crocata* Melzer, 1935. — Brasil (Goyaz).
5. *D. cucullata* Thomson, 1868. — Sul do Brasil.
6. *D. eleganlula* White, 1855. — Tapajoz.
7. *D. farinosa* Bates, 1885. — Panamá.
8. *D. fasciculata* Olivier, 1792. — Cayenna, Brasil, Nicaragua, Mexico.
9. *D. grisea* Aurivillius, 1904. — Bolivia.
10. *D. hirticollis* Olivier, 1795. — Brasil, Colombia, America Central, Antilhas.
11. *D. intricata* Casey, 1913. — Texas.
12. *D. lateralis* Thomson, 1868. — Brasil.
13. *D. multicristata* Bates, 1866. — Amazonas.
14. *D. ornata* Bates, 1866. — Sul do Brasil.
15. *D. pallida* Bates, 1874. — Jamaica.
16. *D. pretiosa* Melzer, 1935. — Brasil (Goyaz).
17. *D. rufocristata* Melzer, 1935. — Brasil (Goyaz).
18. *D. scapularis* Bates, 1885. — Panamá.
19. *D. senicula* Bates, 1866. — Tapajoz.
20. *D. servillei* White, 1855. — Brasil (Espirito Santo).
21. *D. spitzi* Melzer, 1935. — Brasil (São Paulo).
22. *D. venosa* Bates, 1866. — Sul do Brasil.
23. *D. x-signata* Melzer, 1935. — Brasil (Pernambuco).

Das especies aqui enumeradas, 14 se acham representadas na Secção de Entomologia do Instituto de Biologia Vegetal, onde se encontra a celebre collecção de Cerambycideos do saudoso especialista do grupo, Julius Melzer. A especie nova de que trata o presente artigo, é evidentemente proxima de *D. pretiosa* Melzer, cujo typo pude examinar e que é proveniente de Goyaz; differe porém, pelo tamanho menor, thorax mais comprido, desenho dos elytros (ausencia da faixa transversal posterior), antennas mais curtas e pela coloração mais clara do abdomen e das patas.

Desmiphora travassosi n. sp.

Elongata, subcylindrica, rufo-testacea, abunde pilosa. Antennae apicem elytrorum non attingentes, articulo tertio et quarto rectis non flexuosis, quinto dimidio quarti, reliquis aequilongis. Thorax ferrugineus, latitudine longior, lateribus tuberculo acuto post medium utrinque armatus, sat grosse punctatus, duabus vittis niveo tomentosis antice conjunctis, dorso antice penicillis tribus nigris triangulum formantibus. Elytra grosse punctata, nitida, basi thorace latiora, lateribus parallelis, apice conjunctim rotundatis; humeris, marginibus lateralibus et quarto apicali niveo tomentosis; in medio crista primo rufo dein niveo tomentosa, sinuosa, ad suturam continuata; in principio partis declivis utrinque penicillo niveo ornatis.

Subcylindrica, rufo-testacea, com pilosidade abundante. Cabeça rufo-testacea, vertice ennegrecido, densamente pontuada, com pêlos cinzentos. Olhos fortemente granulosos, largamente emarginados, lóbos superiores não muito approximados, lóbos inferiores grandes, quasi circulares, distinctamente convexos; genas moderadamente curtas. Antennas não attingindo o apice dos elytros, rufo-ferrugineas, art. 1-3 e metade do quarto rufo-ennegrecidos; na face interna com pêlos muito compridos, pretos, erectos; na face externa com pubescencia curta, cinzenta, adjacente, densamente agrupada e alguns pêlos erectos moderadamente compridos; escapo engrossado, cylindrico, attenuado nas extremidades; art. 2.º abreviado, ligeiramente mais comprido que largo; art. 3.º e 4.º alongados, subiguaes, um pouco mais longos que o escapo; art. 5.º cerca de metade do 4.º; arts. 6-11 subiguaes, ligeiramente mais curtos que o 5.º.

Thorax mais longo que largo, densamente pontuado, de cada lado com um tuberculo agudo logo atraz do meio. Os lados são occupados por uma faixa tomentosa esbranquiçada, que parte dos angulos posteriores, dilatando-se para a frente e unindo-se no meio do bordo apical, deixando uma área subtriangular ferruginea, brilhante, atravessada no meio por uma fina linha longitudinal de tomento branco; na metade anterior deste triangulo ha 3 tufos de pêlos pretos formando um triangulo.

Escutello pequeno, subrectangular, com pubescencia clara.

Elytros ferrugineos, brilhantes, na base mais largos que o thorax, parallelos, posteriormente arredondados, com numerosas puncturas grossas e profundas; hombros com pubescencia branca, que se prolonga nos bordos lateraes; quarto apical de cada elytro tambem com pubescencia branca; no começo da face declive ha de cada lado um tufinho de pêlos brancos; além disso principia no meio de cada elytro uma crista obliqua, primeiro formada de pêlos

ruivos, em seguida por pêlos brancos. que acompanha a sutura divergindo em seguida e terminando nos tufos de pêlos brancos perto da face declive; no dorso ha numerosas cerdas pretas, e nos lados cerdas claras, erectas.

Processo prosternal estreito, anterior e posteriormente declive. Processo mesosternal pelo menos o dobro mais largo que o prosterno, ligeiramente declive para diante. Prosterno, mesosterno e metasterno ferrugineos. Abdomen e patas um pouco mais claras do que a coloração geral, com pêlos erectos claros e pubescencia branca adjacente, particularmente abundante no abdomen.

Comprimento total 6 mm., largura 2 mm.

HOLOTYPO: — (N.º 8.156) na Collecção do Inst. de Biol. Vegetal.

HABITAT: — Jussaral, Municipio de Angra dos Reis, Est. do Rio de Janeiro, Setembro de 1934, Dario Mendes leg.

A especie é dedicada ao Prof. Dr. Lauro Travassos, o incansavel animador dos estudiosos brasileiros.

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Estampa 1

Fig. 1 — *Desmiphora travassosi* n. sp. (S Lahera phot)



Mendes: Nova especie de *Desmiphora*.

Plicodontinia mourai

Alipio de Miranda-Ribeiro
Museu Nacional do Rio de Janeiro — Brasil

[Com 1 estampa]

Plicodontinia mourai gen. & sp. n.

Afim de ser determinado, recebi do meu amigo o Dr. Mathias Gonçalves de Oliveira Roxo, do Serviço Geologico do Ministerio da Agricultura, o seguinte objecto, procedente do Juruá, onde fôra colligido na areia da barranca do rio pelo Dr. Pedro Moura, do mesmo serviço:

Um dente fracturado na raiz porém reconstituido, de contorno em fórma de ponta de flexa e medindo em millimetros:

Altura total actual (a corôa se acha quebrada na ponta)	36 mm.
Altura medida do collo	11 „
Maior diametro da corôa	21,5 „
Maior diametro transverso da corôa	13 „
Maior diametro da depressão da corôa	12 „
Maior diametro transverso da depressão da corôa	10 „
Comprimento do collo	20 „
Maior diametro transverso do collo	12 „
Altura do collo	4,5 „
Altura do collo na região de implantação da pelle lado interno	2 „
Altura da raiz	24 „
Seu maior diametro	20,5 „
Seu maior diametro transverso	11,5 „

***

É robusto, curto e quasi perfeito; sendo composto de uma corôa recoberta de esmalte corrugado e esverdeado-denegrido e de uma raiz unica de aspecto osseo, longitudinalmente um tanto rugosa e terminando em um conjuncto de pequenas pontas obtusas e pouco salientes e sendo de côr terrosa. O seu aspecto é, grosseiramente fallando, um lozango irregular em que um dos lados (a corôa) fosse muito curto; o outro lado é ligeiramente curvo; isto quando encarado de flanco, porque toda a peça é comprimida, achatada, curva em dois sentidos; a sua relação entre diametros é de 3 : 5. Visto de frente parece ter os lados parallelos.

A corôa vista de cima tem o contôrno irregularmente elliptico, sendo

a face da curvatura concava do eixo do dente subplana e ahi deixando perceber um unico ligeiro vestigio de contacto de cima para baixo. Toda ella é densamente rugulosa, as rugas de carena viva, sendo volumosas e altas as da linha mediana anterior; as oppostas destas estão quebradas, como a ponta do dente. Os lados da corôa que se approximam do collo são roliços e salientes, formando com o centro que é conico e quasi regular um contraste nitido por meio de uma depressão sub-circular continua. O cone central, máo grado a ruptura, mostra uma ligeira inclinação para o lado concavo, interno, e outra para o lado concavo, posterior. Assim, pelo que ahi se acha dito, póde-se concluir:

I — Tratar-se de um dente fossil — de mammifero.

II — Ser esse dente de corôa rugulosa tendo um cone central isolado por uma depressão circular peripherica á base do cone, separando-o dos bordos da corôa.

III — Ser todo elle comprimido e curvo para um dos lados e não indicar outro contacto senão o de seu opposto superior ou inferior.

IV — Ser de aspecto bicolor.

V — Pelo relativo optimo estado de conservação, dureza e peso — parece ser de edade não muito remota.

A projecção lateral da peça faz lembrar vagamente o perfil d'um dente monoradicular de Esqualodonte; é evidente, porém, que nenhuma relação tenha ella com semelhantes animaes a não ser as decurrentes de suas descendencias. Comtudo não deixamos de considerar deva ser de um Odontocete; e que a fórma comprimida, com aquella corôa recoberta de esmalte esverdeado e altamente corrugado, encontra um similar em *Inia* que é justamente um Odontocete, ainda hoje existente nas bacias do Amazonas e de seus tributarios accessiveis. Deve ser, portanto, um antepassado, não muito remoto do Pirayaguara (*Inia geoffrensis*), evidentemente de genero differente, segundo attestam a fórma e os caracteres da peça acima descripta.

Sobre o material fossil constante do Juruá existem as já conhecidas informações de Hermann v. Ihering constantes da Revista do Museu Paulista, vol. VI, 1904, e referidas por M. Schlosser na Centralblatt f. Mineralogie etc., Jahrg. 1925, Abt. B., N.º 8, S. 262-265, onde justamente se lê, como resultado do exame de uma série de photographias levadas áquelle auctor que a peça maior — uma concreção, pertence talvez a um humero visto pelo lado interno e parecido com o de *Zeuglodon*[1].

Os Iniideos, ao contrario, só tem referencias do valle do Amazonas, pela especie conhecida e actual base do genero e da familia. Não obstante Grover Allen descreveu do phosphato de Florida, America do Norte, da mesma familia, tres especies em dous generos — *Schisodelphis* e *Pomatodelphis* — evidentemente com probabilidade continental, além da articulação de encaixo

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[1] "Das grösste Stück, wohl nur eine Konkretion, erinnert etwas an einen von der inneren Seite gesehenen Humerus, ähnlich dem von *Zeuglodon*, das abgesehen von dem Toxodontierwirbel zweitgrösste lässt sich am ehesten mit Serpulit vergleichen." Vide Zittel (Grund. d. Palaeont. pg. 491 - 1923).

— por dentro e por fóra — de seus dentes. É sabido que os Iniideos procedem do Mioceno N. Americano.

Mais afastado ha, entretanto, um outro genero que poderia ser o seu portador por causa da fórma e é *Saurodelphis* de Burmeister, fundado sobre restos achados perto de La Curtiembre e Paraná — margens do rio do mesmo nome na Republica Argentina; e que segundo Cabrera[2] que descreveu os dentes e os alveolos que o osso possue, « tres completos e dous incompletos, com a fórma de ellipse dilatada, apropriada para encerrar a raiz fortemente comprimida que caracteriza os dentes dos Iniideos e sobretudo os de *Saurodelphis*. O maior dos alveolos medindo 23 × 9 millimetros e os espaços variando de dous em dous irregularmente de comprimento etc. ».

Assim, pelos caracteres e medidas que referimos ao descrevel-o, pela comparação da descripção lida em Cabrera, dos dentes e dos alveolos de *Saurodelphis argentinus*, Burm.; pela coincidencia dos caracteres de uma e de outra parte; pela comparação da corôa do dente que nos foi dado para determinar com a reproducção photographica publicada por Othenio Abel[3], acreditariamos ser o dente do Juruá um dente médio posterior da maxilla superior muito proximo pelo menos do genero referido que é do pleistoceno da Republica Argentina.

Mas, ha ainda dous factores a considerar:

I — A differença do dente do Juruá em detalhes menores da descripção dos dentes de *Saurodelphis* dada pelos autores.

II — A differença das bacias de procedencia.

Sei que a differença primeiro referida poderia corresponder á posição funccional do orgam, mas a meditação sobre o que se vê nas estampas citadas e mais o receio de resolver com os elementos actuaes, não dispondo senão de um unico objecto isolado para julgar, não me deixam outro caminho sobre tão restricta base. Accresce ainda a apparencia da conservação das peças comparadas que deve tambem ser levada em conta. Reconhecido positiva ou negativamente o dente aqui descripto como de « *Saurodelphis* » e teremos um elemento seguro para dizer se a bacia do Amazonas foi ligada á do Rio da Prata no periodo pleistocenico.

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[2] Rev. do Mus. de La Plata, tomo XXIX (3a. Ser. tomo V) - pg. 490 - 1926.
[3] Sitz. Ber. Akad. Wien - 118 - 1 - pg. 255 - 227 - est. I fig. 2.

Estampa 1

Plicodontinia mourai. Varios aspectos.



Miranda-Ribeiro: *Plicodontinia mourai.*

Hexylresorcinol and Alantolacton in Therapy of Human Ascariasis

Kenji Momma, Jirô Yamashita, and Kiyoshi Kamitani
Division of Parasitology, Institute for Research in Microbic Diseases, Ôsaka Imperial University, Ôsaka, Japan

[With 3 tables]

Hexylresorcinol

Hexylresorcinol which has a maximum bactericidal effect and a minimum toxic action among 4-n-alkylresorcinols was introduced as an ascaricide by P. D. Lamson and his collaborators in 1930. Since then the clinical experiences with it have been done by many other authors. Hexylresorcinol according to P. D. Lamson removes 90-95 per cent. ascaris, 80-85 per cent. hookworms and 40-50 per cent. whipworms in a single dose. W. W. Cort and G. F. Otto (1933) recommended the substance as an effective ascaricide and they stated that an important forward step in treating this parasite had recently been made by the experiments of Lamson and his co-workers on the use of hexylresorcinol.

Hexylresorcinol is a white crystalline substance, sligthly soluble in water and acts on the cuticula of the worm. Its local irritant action which occurs in the mouth or stomach is entirely superficial and temporary. No pathological changes in any organ are proved in the therapeutic dose of the substance. About 70 per cent. of the amount ingested is excreted unchanged in the stool, while the rest is excreted in the urine. It has the disadvantage of reacting with food and becoming ineffective, so that it must be taken on an empty stomach and no food is allowed for three or four hours after treatment. In order to avoid the local irritation in the mouth hexylresorcinol in gelatine capsules or sugar coated pills are preferable.

The results of our experiments in Japan are given in the following table 1.

The results in our 90 cases were in general far from satisfactory as compared with the results reported by P. D. Lamson and his co-workers, although the table shows a good efficiency with single 0.5 gm. dose of the substance. No evidences of ill effect were observed after treatment, yet a number of the patients complained of slight subjective symptoms as is shows in table 2.

TABLE 1. — Ascaris: Effect of hexylresorcinol.

Total dose of hexylresorcinol, gram	*Method of administration*	*Number of cases*	*Egg count per gram formed basis (Stoll's method)* *Before treatment*	*After treatment*	*Per cent. reduction*	*Per cent. cured*	*Remarks*
0.5 (in gelatine capsules)	I day 0.1 at 10.0 a. m. II day 0.2 at 10.0 a. m. III day 0.2 at 10.0 a. m.	10 (age 11 - 12)	49,000	23,000	53	40	simultaneously with 0.2 gm. phenolphthalein at the last dosage.
0.5 (in gelatine capsules)	in single dose at 11.0 a. m.	20 (age 7 - 10)	235,400	60,900	74	65	simultaneously with 0.2 gm. phenolphthalein; no lunch after treatment.
1.5 (in gelatine capsules)	I day 0.5 at 11.0 a. m. II day 0.5 at 11.0 a. m. III day 0.5 at 11.0 a. m.	46 (age 8 - 15)	311,900	148,100	53	30	in 39 cases simultaneously with 0.2 gm. phenolphthalein at the last dosage and in the rest at every dosage; no lunch after treatment; in 10 cases treated at bedtime.
1.0 (in wafers)	in single dose at bedtime	14 (age 17 - 25)	135,200	95,600	29	43	with 0.4 gm. phenolphthalein in the following morning.

TABLE 2. — Slight subjective symptoms after treatment with single 1-2 gm. dose of hexylresoreinol.

Subjective symptoms	*Cases 55 (age: 16 — 23)*	
No complaint	24	46.2 %
Abdominal discomfort	3	5.8 %
Abdominal pain	2	3.9 %
Epigastric discomfort	10	19.2 %
Headache	13	25.0 %
Facial itchness*	3	5.8 %

* That is not due to internal use of hexylresorcinol, but to its accidental touch with the skin causing irritation.

Alantolacton

Alantolacton that is obtained from the root of *Inula helenium* L. has a chemical composition being closety similar to that of santonin and anthelmintic properties, but owing to its bitterish taste and vomitive action it has not been used as a practical vermifuge.

S. Ozeki, M. Kotake and K. Hayasi (1936) reportet that alantolacton from which tigher terpene-tike substances were comptetely separated had no longer exhibited a vomitive action and a serverely bitterish taste. According to the authors the purified alantolacton is a quite effective anthelmintic, removing 93-100 per cent. ascaris and furthermore it has the advantage over santonin.

In our limited clinical experiences with it unfortunately no satisfactory results were obtained and in a few occured a stight headache or nausea after treatment.

TABLE 3. — Ascaris: Effect of alantolacton.

Total dose of hexylresorcinol, gram	*Method of administration*	*Number of cases*	*Egg count per gram formed basis (Stoll's method)*		*Per cent. re-duction*	*Per cent. cured*	*Remarks*
			Before treatment	*After treatment*			
0.15	I day 0.05 at 10.0 a. m. II day 0.05 at 10.0 a. m. III day 0.05 at 10.0 a. m.	9 (age 11 - 13)	95,800	74,800	22	33	simultaneously with 0.2 gm. phenolphthalein at the last dosage.
0.1	in single dose at 10.0 a. m.	4 (age 8 - 9)	36,800	27,400	26	0	simultaneously with 0.2 gm. phenolphthalein.
0.2	I day 0.1 at 10.0 a. m. II day 0.1 at 10.0 a. m.	23 (age 7 - 15)	151,100	118,900	21	17	in 15 cases simultaneously with 0.2 gm. phenolphthalein at every dosage and in the rest at the last dosage.
0.15	in single dose at 10.0 a. m.	5 (age 7 - 15)	13.600	13.300	2	20	simultaneously with 0,2 gm. phenolphthalein.

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Duas especies novas de molluscos marinhos do Brasil

F. Lange de Morretes

Museu Paulista — Brasil

[Com 1 estampa]

Deu-me o Exmo. Dr. Affonso d'Escragnolle Taunay, Director do Museu Paulista, a opportunidade de fazer uma excursão malacologica á Ilha de São Sebastião, já bastante estudada pelos nossos naturalistas.

Fiz centro desta pequena excursão, que durou apenas 2 mezes, em Castelhanos.

Junto a Castelhanos, tambem na Bahia dos Castelhanos, existe uma pequena Praia, de pouco mais de cem metros de extensão, chamado do Gato (Est. 1, fig. 1).

Esta praia, de onde se avistam os Morros do Sombrio, é ladeada de rochedos enormes.

Sua areia grossa é batida pelas ondas de um mar immensamente revoltado, que lhe deposita valvas de animaes de vida abissal.

Entre as grinaldas de verdes algas, que os rebentos das cheias deixam na praia, encontram-se molluscos interessantes como representantes dos generos *Conus*, *Epitonium*, *Oliva*, *Cypraea*, *Clathrodrillia*, etc.

Constatei, ahi, pela primeira vez *Epitonium hottesierianum* (Orbigny), concha do subgenero *Opalia*, nova para as Collecções do Museu Paulista e ao meu saber para toda a America do Sul, pois, d'Orbigny (8), Tomo II, pg. 16, dá da bella concha que reproduz no Album, Est. X, figs. 22, 23 e 23', como *habitat* Guadeloupe e não me é conhecida outra referencia ao sul das Antilhas.

Este facto, como o de ter encontrado em Villa-Bella, tambem na Ilha de São Sebastião, *Psammosolen sanctaemarthae* (Orbigny) (*Solecurtus Sanctae Marthae*, d'Orbigny, *op. cit.*, pag. 232), demonstra a necessidade de se fazer pesquizas mais frequentemente no vasto Littoral Brasileiro, pois, certos animaes teem uma distribuição geographica muito mais ampla do que se suppõe.

Não se concebe, mesmo, o numero dos Molluscos, referentes á enorme Costa do Brasil, ser inferior a 600, incluidos nelle os molluscos terrestres e de agua-doce, quando um Catalogo, só de Molluscus Marinhos, do Labrador a Texas, cita 2.632 animaes (Charles W. Johnson — 1934).

Foi na Praia do Gato, por mim visitada, quasi que diariamente, durante o tempo feliz em que fui hospede do Snr. Leonardo Reale em Castelhanos, que encontrei a especie que passo a descrever:

OLIVIDAE

Genero: — AGARONIA Gray, 1839.
Syn.: — *Hiatula* Swainson, 1840.
Oliva, pars, auct.

Agaronia travassosi sp. n.
(Est. 1, figs. 2-5).

HABITAT: — Praia do Gato, Bahia dos Castelhanos, Ilha de São Sebastião.
COLLECTOR: — Autor, em Julho de 1936.
TYPO: — N.º 14.104.
PARATYPO: — N.º 14.105 na Collecção do Museu Paulista.

Concha fusiforme-ovalada, espira acuminada de sutura linear, circumvolução apical escuro-esfumaçada, base da ultima circumvolução do apice cinza-claro, circumvolução maior marfim-esfumaçado, coberta de linhas transversaes interruptas, formando manchas e angulos pardo-escuros de tamanho desigual, columella branca, abertura e callus azulado-cinza quasi branco, base da côr do desenho com estria mediana clara côr do fundo do mesmo.

TYPO, valva de animal adulto, faltando o apice:

Comprimento	14 mm.
Diametro maior	19 mm.
Comprimento da abertura	35 mm.
Diametro maior	9 mm.

PARATYPO, valva de animal jovem com apice perfeito:

Comprimento	20 mm.
Diametro maior	8 mm.

Ambos encontrados sem animal.

Differe de *A. hyatula* (Gmelin), pela conformação mais abobadada e ovalada da ultima circumvolução, pelo que se assemelha um tanto á *A. testacea* (Lamarck), pelo apice, que tambem *A. testacea* tem mais agudo e ainda pelo desenho mais accentuado.

Dedico esta especie ao eminente zoologo patricio Prof. Lauro Travassos, que ora póde volver a vista a um passado de vinte e cinco annos de proficua actividade, enriquecendo a sciencia e elevando o nome do Brasil.

Agaronia lanei sp. n.
(Est. 1, figs. 6, 7).

HABITAT: — Guaratuba, Estado do Paraná.
COLLECTOR: — Autor, em 1927.
TYPO: — N.º 88 na Collecção do autor.

Concha fusiforme-ovalada, espira acuminada, de sutura linear e apice não tinto, de conformação geral semelhante á *A. travassosi*, cinza-claro com estrias transversaes onduladas de côr mais escura, columella, callosidade e base brancas.

Valva de animal adulto:

Comprimento	46 mm.
Diametro maior	19 mm.
Abertura	35 mm.
Abertura, diametro maior	9 mm.

Esta concha, colhida sem animal, é affim a *Agaronia steeriae* (Reeve) da Africa Occidental, que ao contrario de Gray (9), repnto bôa especie e não synonyma de *A. testacea* (Lamarck). Reeve (6) dá na estampa XVIII, sob n.º 37 um bom desenho da *steeriae* e em sua critica diz:

«...the general colouring of the shell is more like that of the Mexican *O. testacea*. It differs, however, from the last-named species both in the depression of the columella, which gives it a boat-shaped form, and in having a shorter spire».

Examinei exemplares de *A. testacea* existentes na Collecção do Museu Paulista e provenientes do Panamá e concordo plenamente com Reeve.

Ainda que sua Monographia do genero *Oliva* não tenha estructura systematica, é optima quanto ás diagnoses e illustrações.

Se quizessemos unir animaes tão bem differenciados nem uma das *Agaronia* manteria seu valor especifico.

Agaronia lanei differe da *steeriae* não só pelo colorido e tamanho (Reeve dá á figura 63 mm.) mas, tambem, pelas circumvoluções apicaes mais elevadas e não concavas.

Dedico-a ao collega e amigo Dr. Frederico Lane.

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Estampa 1

Fig. 1 — Praia do Gato. Téla do Autor.
Figs. 2, 3 — *Agaronia travassosi* n. sp. (Typo).
Figs. 4, 5 — *Agaronia travassosi* n. sp. (Paratypo) jovem.
Figs. 6, 7 — *Agaronia lanei* n. sp. (Typo).

Camargo-Andrade phot.



Morretes: Molluscos marinhos do Brasil.

A new Spirurid Nematode from a Mongoose

H. O. Mönnig
Section of Parasitology, Onderstepoort — South Africa

[With 1 plate]

The worms here described were collected by Dr. A. D. Thomas from a mongoose, *Myonax cauui cauui*, at Onderstepoort. Two male worms were found partly embedded in the mucosa of the oesophagus, while five males and six females were lying free in the stomach.

The worms are of moderately small size, white in colour and were somewhat curled up on account of having been fixed in formalin. The tails of all the males are curled in a spiral.

The cuticle bears fine transverse striations. The most prominent external feature of the parasite is a ventral « hump », as is found in *Spirura*, about 1 mm. from the anterior extremity (fig. 1). The mouth opening is elongated dorso-ventrally and its rim is formed by the chitinous lining of the vestibule, which projects on to the body surface, forming dorsally as well as ventrally around the mouth opening five chitinous projections in a roughly pentagonal pattern (figs. 2, 3, 4).

Laterally to the mouth opening there are two simple lips, each bearing on its medial surface a small bi- or tricusped tooth. The anterior extremity also bears four submedian and two lateral papillae.

The vestibule is wide in lateral view, narrow in dorsal or ventral view. It has a strong cuticular lining which projects forwards to form the dorsal and ventral structures around the oral opening, as described above, and also the tooth-like projections on the insides of the lips.

The oesophagus is long and is divided into a short, narrow, muscular part and a long, wider, glandular part. The muscular portion is surrounded by the nerve-ring just behind its middle. The excretory pore opens near the junction of the two parts of the oesophagus, while a pair of small, lateral, cervical papillae are situated at the level of the middle of the first part.

The tail of the male is spirally coiled and is in most specimens symmetrical, although in one case there is a marked asymmetry (fig. 6) which also affects the caudal papillae. There are fairly large lateral cuticular alae and the ventral surface of the posterior extremity is covered with cuticular bosses. There are four pairs of pedunculated precloacal papillae. The anterior lip of the cloacal aperture is prominent and bears a small, sessile papilla. Immediately posterior to the cloaca there are two small, sessile papillae near the mid-line and another pair of larger papillae on the same level but placed more laterally. Two-thirds down the length of the tail there is a pair of large, shortly pedunculated papillae, followed by a pair of smaller ones and near the tip of the tail are three pairs of papillae of which the middle pair

is the smallest (fig. 5). In the asymmetrical specimen several papillae on the right side of the tail are missing.

Two spicules and a gubernaculum are present. The right spicule is shorter than the left and is smooth, while the left has a corrugated surface, both have sharp points. The gubernaculum is triangular in shape with the apex pointing backwards.

In the female the tail is simple and bluntly pointed.

The vulva is situated more or less at the beginning of the last third of the body. It has rather prominent lips and leads into a short, thick-walled vagina. This is followed by a short, wide chamber, continued into an unpaired narrow duct and then two rather long, paired ducts which lead into the uteri. The vagina and wide chamber are directed backwards, the uteri run in opposite directions. The eggs are moderately thick-shelled, flat or even slightly concave on one side and contain an embryo when laid.

Measurements in millimeters.

	Male	*Female*
Body length	10.8 — 17.7	16.3 — 20
Width	0.3 — 0.35	0.44 — 0.46.
Ventral hump	0.975 — 1.17	1.0 — 1.25
Cervical papillae	0.126 — 0.137	0.13 — 0.15
Nerve ring	0.197	0.21
Excretory pore	0.25 — 0.263	0.25 — 0.276
Vestibule depth	0.039	0.039 — 0.042
Muscular oesophagus	0.195 — 0.26	0.273 — 0.286
Glandular oesophagus	4.29 — 5.34	5.9 — 7.7
Tail	0.338 — 0.468	0.195 — 0.221
Right spicule	0.263 — 0.3	—
Left spicule	0.494 — 0.559	—
Gubernaculum	0.092	—
Vulva from posterior end	—	5.3 — 6.4
Vagina	—	0.325
Wide chamber	—	0.169
Unpaired utera duct	—	0.39
Eggs	—	0.047 × 0.026

The parasite obviously belongs to the *Spiruridae*, subfamily *Spirurinae*, and is most closely related to the genus *Spirura*, from which it differs, however, in the presence of teeth and the other chitinous structures dorsal and ventral to the oral aperture.

It is therefore necessary to create a new genus for this parasite and the name *Travassospirura dentata* is proposed for it in honour of Dr. L. Travassos.

Generic diagnosis. — *Travassospirura* — *Spirurinae:* Cuticle transversely striated and forming a prominent ventral hump in the oesophageal region; mouth elongated dorso-ventrally and surrounded by two lateral, simple lips; cuticle of vestibule extended forwards to form a tooth medially to either lip

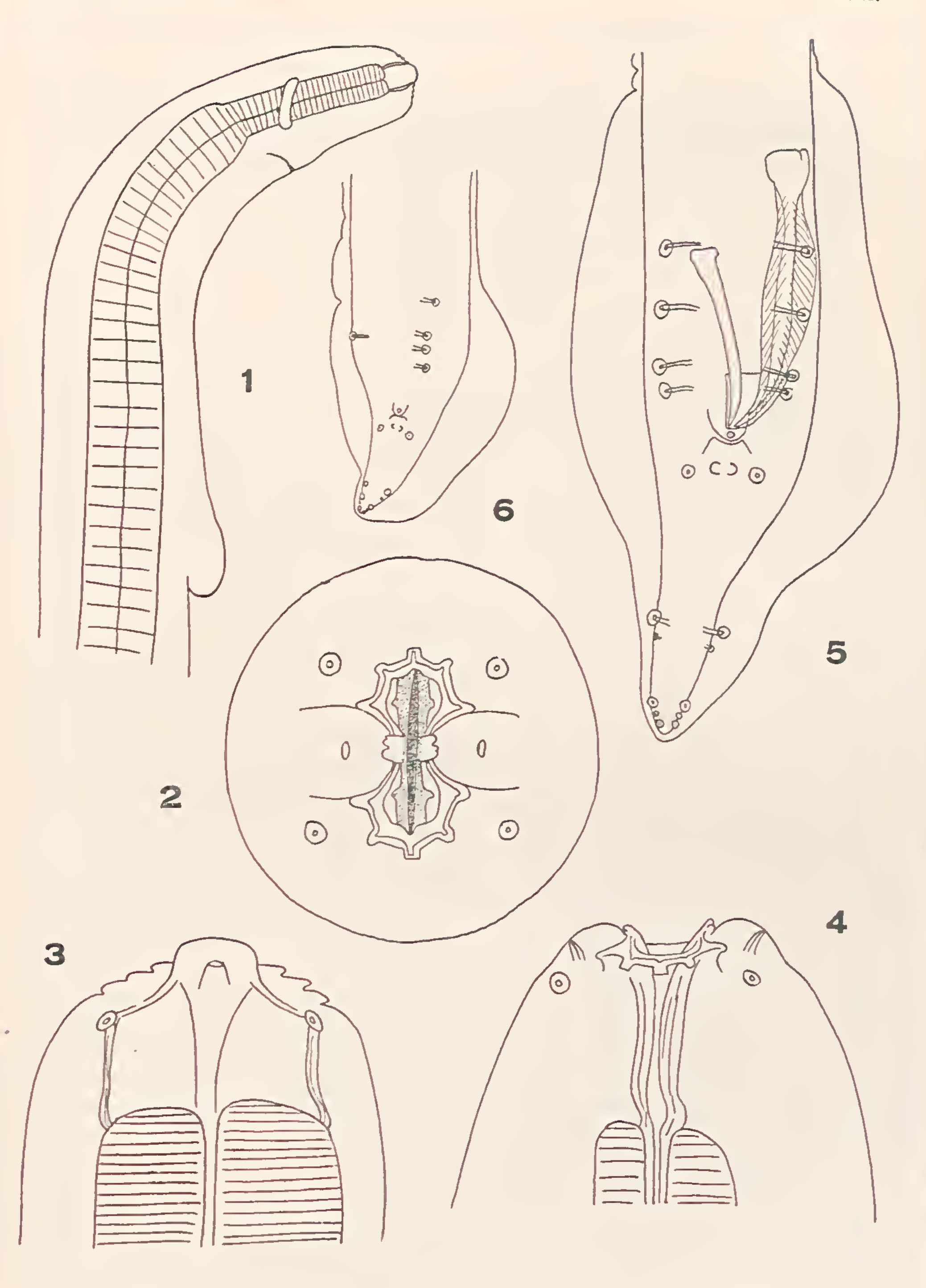
and projecting chitinous processes between the lips; lateral and submedian cephalic papillae present; vestibule well developed, wide dorsoventrally and narrow laterally; oesophagus long and divided into a short muscular and a longer glandular portion. *Male.* — Posterior extremity with caudal alae; four pairs of pedunculated and one sessile preanal papillae, seven pairs of post-cloacal papillae; spicules unequal and dissimilar; gubernaculum present. *Females:* — Vulva behind middle of body; oviparous. Parasites of carnivora.

TYPE SPECIES: — *Travassospirura dentata.*
HOST: — *Myonax cauii cauii.*
LOCALITY: — Onderstepoort, Transvaal. Collected 10. 3. 37.
Types in Onderstepoort Helminthological Collection N.º 2626.

Plate 1

Travassospirura dentata n. sp.

Fig. 1 — Lateral view of anterior end.
Fig. 2 — Anterior view of head.
Fig. 3 — Lateral view of head.
Fig. 4 — Dorsal view of head.
Fig. 5 — Hind end of male.
Fig. 6 — Hind end of male, asymmetrical specimen.



Mönnig: A new Spirurid Nematode.

An Additional Species of Diphyllobothrium (Subgenus Spirometra) from the United States

Justus F. Mueller
N. Y. State College of Forestry, Syracuse, N. Y. — U. S. A.

[With 1 plate]

Mueller (1935) described *Dyphyllobothrium mansonoides* from the cat and the dog in the vicinity of Syracuse, N. Y., and in later papers (1936, 1937 etc.) reported on its life history, suggesting that this species may be responsible for the few cases of sparganosis in man which have been reported for the United States. It is the purpose of the present paper to show that yet another species of *Diphyllobothrium* of the subgenus *Spirometra* occurs in this country. This form was encountered when spargana from the water snake, *Natrix*, from Sarasota and Silver Springs, Florida, were reared experimentally to obtain adults (Mueller, 1937). Numerous spargana from this source were fed to 5 cats and 2 of these animals were killed at the end of 2 weeks. It was from these that the individuals of the present species were collected. Immature or young individuals of *D. mansonoides* were collected from these 2 cats, and many additional *mansonoides* were obtained from the other 3 cats killed at the end of 3 weeks. But none of the present form were found in the cats which were allowed to survive 3 weeks after infection. The individuals of the present species were small, and most of them immature, though a few were mature. Therefore, apparently, the cat is not the normal host of this worm. Individuals are able to mature in this animal only with difficulty, and apparently none are able to survive in it for a period exceeding 3 weeks.

The morphology of the worm is very suggestive of *D. mansoni* (= syn. of *D. erinacei*, according to Iwata, 1933) but these worms are smaller than the usual run of this species. The worms are about 15 to 20 cm. in length, and a maximum of 2 mm. in width. The mature proglottids are longer than broad, but this may simply be a character of the young worms, since in other species this proportion frequently reverses itself with age. The neck is about 1 cm. long, thin and delicate, and the scolex about 1 mm. or less in length. The edges of the bothria are thinner than in *mansonoides*, more on the order of *mansoni*. All told there are about 200 proglottids in the worm. I do not believe the cat is the proper host for the form. The figures given above would have to be modified and probably increased for older worms reared in the proper definitive host, since such worms would undoubtedly thrive better and reach a larger size than the present specimens.

The anatomy of the proglottids is very characteristic. The vitellaria are lacking in the median ventral longitudinal field, but they meet anterior to the cirrus sac. The cirrus and vagina are as in *D. mansonoides*, or *D. mansoni*, which is to say characteristic of the subgenus *Spirometra*. The uterus opens

by a pore well separated from and posterior to the vagina, and can be distinguished at a glance from that of *D. mansonoides*. The outer coils perform about 5 to 7 lateral loops, and end in a spherical terminal chamber which lies on the median line. In *mansonoides* this chamber lies on one side of the median line, and the uterus has only two loops. These outer coils are invested with a darkly staining layer of glandular epithelium. The testes lie in a single layer in the medullary portion of the proglottid. The ovary is wingshaped and reticulate. The cirrus sac is compound, containing proximally a muscular vesicula seminalis externa, and distally the muscular cirrus proper. The vagina consists of a spacious transverse vestibule or vulva, with the vagina proper opening off abruptly from the anterior wall of this structure, as it does in other species of *Spirometra*. The remaining anatomy is in general typical of this group.

Ordinarily the worm should be identified as *D. mansoni* except for certain biological considerations. *Mansoni* finds the cat a favorable host. Apparently the present form does not. It does not therefore seem wise to arrive at any specific determination at this time. Mueller (1937) has suggested that the genus *Diphyllobothrium* be split up into three genera, on the basis of the arrangement of the genital pores, and characters of the cirrus sac, scolex, and neck. According to this suggestion the present form is a member of the genus *Spirometra*. I have not followed this suggestion of recognizing the generic rank of *Spirometra* in the present paper, however, because it seems desirable to wait until other workers have had time to comment on the proposal before putting it into effect.

I am indebted to Dr. Allen Mc Intosh of the U. S. Bureau of Animal Industry for calling my attention to a specimen in the Helminthological Collections of the U. S. National Museum. This specimen, N.º 42296, is a poorly prepared and mounted fragment of a *Diphyllobothrium* from a raccoon taken in the Okefinokee Swamp, Georgia. This agrees in size roughly with the present form, but details of anatomy cannot be made out, so that a detailed comparison is impossible. Dr. T. W. M. Cameron (1936) has described a form from the raccoon in Trinidad, which also appears to agree roughly with the present species. There appears therefore a possibility which is well worth looking into, that the normal definitive host of the present form may be the raccoon of the southeastern United States. Experiments are now under way to determine definitely the host relationships and also to elucidate the complete life history of this form.

The worm is of particular interest in that it injects into the picture another form which may possibly be responsible for reported cases of sparganosis in this country. It is known that the spargana of *mansonoides* thrive in numerous animals including experimentally infected monkeys, and therefore it is probable that they can also infect man. The sparganum of the present species, however, is known only from the water snake, so far, but it too may have a wide range of host tolerance, and may also be regarded as a possible cause of human sparganosis. This question will be settled as the result of experiments now under way.

There arises the further question as to the exact limits of the species *D. mansoni*, or *D. erinacei*. According to Iwata (1933) *D. reptans*, *D. okumurai*, *D. mansoni*, *D. ranarum*, *D. decipiens*, *D. houghtoni*, and *D. erinacei* are all one and the same species and proglottids of each of these «species» can be

found in one and the same worm. These species have been found in Japan, China, India, and other parts of Europe and Asia. There is also a species similar to *mansoni* in Porto Rico, still another in Central America, and 2 more in Trinidad, recently described by Cameron (1936). This paper now lists a species of this morphology from the United States. The present form appears unlike « *mansoni* » in that it does not thrive in the cat, whereas « *mansoni* » does. Spargana of *mansoni* are found in frogs in China and Japan, but frogs from Florida, from the same regions where water snakes carried this worm, were not infected with spargana. What is known of the relationships of certain other forms does not always seem consistent with the idea that among all these worms only a single species is represented.

It is possible that we are here dealing with a single species of very wide distribution and very wide range of host adaptation. On the other hand it seems possible that too many things may be grouped together under a single designation, as *D. erinacei (mansoni)*, for no better reason than that they are not sufficiently understood to comprehend the differences which really do exist. Such a catch-all may eventually break down of its own weight. Possibly there is a way of logically breaking up this group, the key to which has not yet been hit upon. Yokogawa & Kobayashi (1930) are of the opinion that this complex state of affairs may be the result of hybridization between a number of originally separate but closely related species, as a result of their parasitizing the same hosts, dogs and cats. As further evidence of this view they point to the lack of host specificity in these worms, a condition which is not general in other classes of parasites. This suggestion seems to be a good one, and is worthy of more consideration than it has received. Experiments on possible hybridization between *D. mansonoides* and one of its close relatives are now being formulated at this laboratory.

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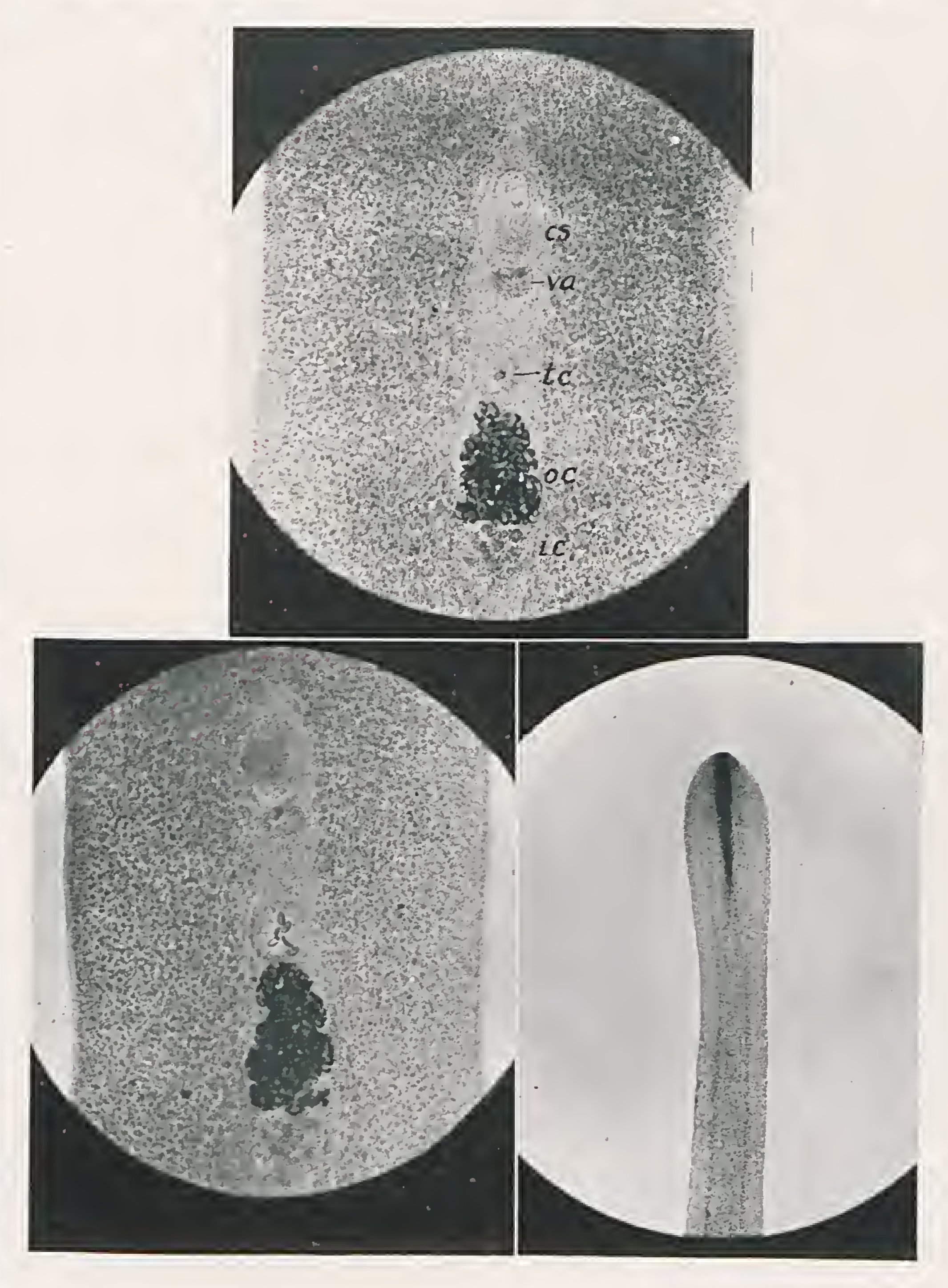
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Plate 1

Figures of a species of *Diphyllobothrium* raised in a cat from spargana from Florida *Natrix*.

Fig. 1 — Mature proglottid, showing distribution of vitellaria; the cirrus sac, *cs*; vagina, *va*; the terminal chamber of the uterus, *tc*; outer coils of uterus *oc*; inner coils, *ic*.
Fig. 2 — Mature proglottid, showing same features as Fig. 1, but the cirrus is extended.
Fig. 3 — The scolex, showing the delicate bothria and anterior part of the neck.



Mueller: An Additional Species of *Diphyllobothrium.*

The Genera Asymmetricostrongylus Nagaty, 1932 and Libyostrongylus Lane, 1923 and their Relation to the Genus Trichostrongylus Looss, 1905

H. F. Nagaty, M. Sc.
Liverpool — England

[With 4 plates]

Introduction

While working on the genus *Trichostrongylus* Looss. 1905, I naturally came across certain species which were referred to this genus with uncertainty by their authors. These species referred to were described as *T. asymmetricus* Cameron, 1926, *T. dissimilis* Wood, 1930 and *T. australis* Wood, 1930. On the other hand the genus *Libyostrongylus* erected by Lane in 1923 to accomodate *Strongylus douglassii* Cobbold, 1882 and another species described by the former author as *L. hebrenicutus*, was treated as a genus of doubtful status by certain authors as Yorke & Maplestone, while Baylis & Daubney did not consider it as a valid genus but as a synonym to the genus *Trichostrongylus*. In my paper entitled « The genus *Trichostrongylus* Looss, 1905 , I briefly mentioned that the genus *Libyostrongylus* is valid and proposed a new genus which I called *Asymmetricostrongylus* for *A. asymmetricus*, *A. dissimilis* and *A. australis*.

Owing to the rush to the press I stated that the reasons for this will be discussed in a later communication in detail; for the same reason I did not give the definition of the genus *Asymmetricostrongylus*. The present paper thus forms a sequel to my above mentioned paper.

Since the publication of my paper concerning the genus *Trichostrongylus* seven new species were described and these are, *T. triramosus* Schulz, 1931, in *Lepus timidus gischiganus* from the U.S.S.R., *T. pietersi* Leroux, 1932 in sheep and goats from S. Africa, *T. thomasi* Mönnig, 1932, in the impala, *Aepyceros melampus* from S. Africa, *T. minor* Mönnig, 1932 in the blesbuck, *Damaliscus albifrons* from S. Africa, *T. hamatus* Daubney, 1933 in sheep from Kenya, *T. longispicularis* Gordon, 1933 in sheep from Australia and *T. nagatyi* Freitas & Lent, 1935 in *Rhynchotus rufescens* from S. Paulo, Brazil. The author have seen the references concerning all these species with the exception of the first one, *T. triramosus*.

Luckily and mainly through the kindness of Dr. H. A. Baylis of the British Museum I was able to examine types and cotypes of these species and thus come to these conclusions.

The genus *Trichostrongylus* is a very homogeneous one and its characteristics are mentioned in my paper dealing with its members. The genus *Asymmetricostrongylus* mihi differs from the above mentioned genus, firstly in the larger size of the worms and secondly in the asymmetry of the bursa, the

right lobe is slightly smaller than the left one and consequently its rays are also shorter than these of the corresponding lobe. Thirdly it differs in the possession of a cuticular broad lateral flange on the right side only of both males and females. Fourthly in the shape and mode of branching of the dorsal ray and lastly in the peculiarly placed horizontal vulva and its possession of cuticular lips. The genus *Libyostrongylus* Lane, 1923 differs from the genus *Trichostrongylus*, firstly in the type of the dorsal ray and its mode of branching; secondly, the ventro-ventral is very slightly separated from the other ventral ray; thirdly in the presence of a very prominent pair of large pre-bursal papillae; fourthly, a dorsal lobe is recognisable and lastly the vulva is transversely situated to the long axis of the body.

In the following pages I redescribed these five species for two purposes, the first is the presence of many discrepancies and errors in the descriptions known and secondly in the unpracticability of some of the descriptions and figures given.

All the figures in this paper are camera lucida drawings of types and cotypes made by the present author.

CLASSIFICATION OF THE GENERA

Order **STRONGYLOIDEA** Weinland, 1858.

Family *TRICHOSTRONGYLIDAE* Leiper, 1912.

Subfamily **Trichostrongylinae** Leiper, 1908.

DIAGNOSIS OF THE GENUS

Asymmetricostrongylus Nagaty, 1932.

Delicate worms with the cuticle finely transversely striated. A cuticular well developed lateral flange is found on the right side only in both males and females. This flange extends from the posterior extremity and fades away towards the anterior end of the worms. Oral cavity is very small, oesophagus simple, club-shaped. Male bursa well developed, with an ill defined dorsal lobe. Lateral lobes slightly asymmetrical in size, the right lobe being smaller than the left and consequently its rays are slightly shorter than those of the left side. Ventral rays are wide apart and of different thicknesses; the ventro-ventral is thin and ventrally directed, the latero-ventral is thick, divergent from the ventro-ventral and close to the laterals, forming one group with the externo- and medio-lateral rays. Postero-lateral ray thinner than, and divergent from, the remaining laterals. Dorsal ray cleft for more than half its length, each division ending in a bifid termination. Spicules equal in length and similar in shape, well chitinised with crests and protuberances and have a broad truncated proximal part and narrow tapering distal part. An elongated accessory piece is present. The vulva of the female is transversely situated and is at about the junction of the middle with the posterior thirds of the body. Ovejectors are well developed and are amphidelphys. Parasites of the alimentary tract of the Wallaby.

TYPE SPECIES: — *A. asymmetricus* (Cameron, 1926) Nagaty 1932.

OTHER SPECIES: — *A. dissimilis* (Wood, 1930) Nagaty, 1932. *A. australis* (Wood, 1930) Nagaty, 1932.

DESCRIPTION OF THE SPECIES

Asymmetricostrongylus asymmetricus (Cameron, 1926) Nagaty, 1932.
(Pl. 1, figs. 1-6).

The material available for examination were two males and two females, part of Cameron's type specimens. They were examined in the Zoological Division of the British Museum, London.

The worms are somewhat large and stout in comparison with members of the genus *Trichostrongylus*. The body is gradually attenuated anterior to the genital opening. The buccal cavity is very small. The head is provided with three inconspicuous lips and punctiform papillae. No cervical papillae present. The head measures 22 microns in width. The excretory pore is situated at a distance of about 360 microns from the cephalic end. The oesophageal nerve ring is situated at a distance of about 352 microns from the cephalic end. The oesophagus is simple measuring from 760 microns to 955 microns in length. The cuticle is transversely striated and shows a well developed lateral flange on the right side only. This cuticular flange is well developed at the posterior end of the worm and disappears towards the anterior half.

The male measures about 7.505 mm. in length and 79 to 88 microns in maximum breadth immediately anterior to the bursa. The bursa is well developed but shows a marked asymmetry. the right lobe is slightly shorter and smaller than the left one and consequently its rays are also shorter than those of the left one. The asymmetry is more marked in the following two species of this genus. The bursal formula is as follows: ventro-ventral ray is narrow and is wide apart from the ventro-lateral. The latter is close to the laterals proximally but diverges distally; it is the broadest ray. Externo-lateral and medio-lateral are closer together than the others but slightly diverge distally; they are of about the same breadth, the former is slightly broader than the latter. Postero-lateral is as broad as the medio-lateral and diverges from it at an angle of about 20°. The externo-dorsal ray is fairly long and reaches the edge of the bursa.

The dorsal ray is about 88 microns in length and divides into two long divisions, each of which end in two small papillae distally. The main stem of the dorsal ray is a little longer than one fourth of the total length of the ray. The right division of the dorsal lobe is slightly shorter than the left one.

The spicules are comparatively narrow, slightly chitinised and of about the same length and shape. The right and left edges of the spicules are parallel. Each ends posteriorly in an elongated slender sharply pointed portion. The spicules measure 185 microns including this elongated slender portion and 132 microns without it. Springing from the dorsal surface are two narrow processes which are directed backwards; their posterior tips are twisted outwardly at the junction of the slender posterior portion with the rest of the body of the spicule. The spicules are bent ventrally when viewed laterally and the posterior slender portions are twisted but are straight when viewed either from the dorsal or the ventral aspects.

The gubernaculum measures 110 microns to 114 microns in length and viewed dorsally it appears spindle-shaped with an anterior and a posterior narrow portion and a middle swollen portion. When viewed laterally it comprises a narrow band with an anterior ventrally bent part and a posterior straight part.

The female measures 11.21 mm. to 13.205 mm. in length and 154 microns in maximum breadth at the region of the vulva. The latter is in the form of a slit that is transversely situated to the long axis of the body of the parasite and the cuticle anterior to it forms a fairly large process covering the vulva, somewhat after the fashion of a young female *Haemonchus contortus*. The slit of the vulva measures 110 microns long and is situated at a distance of 3.8 mm. from the tip of the tail. The uteri are divergent and the ovejectors are comparatively short and strong; they measure from 383 microns to 418 microns in length. The anterior ovary bends backwards at 1.235 mm. to 1.662 mm. from the cephalic end; the posterior ovary bends forwards at 760 microns to 912 microns from the tip of the tail. The anus is situated at 330 to 352 microns from the tip of the tail. The diameter of the body at the region of the anus is 66 microns. The body of the female gradually and evenly tapers posterior to the loop of the posterior ovary to the tip of the tail. The tip of the tail is rounded or stightly swollen and is directed dorsally.

Intrauterine eggs are elongated, thin shelled and are broader at one side than the other. They measure 136 microns × 75 microns to 84 microns.

Habitat and host: stomach and occasionally in the first part of the small intestine of the bennett wallaby, *Macropus bennetti*.

Asymmetricostrongylus dissimilis (Wood, 1930) Nagaty, 1932.

(Pl. 2, figs. 1-6).

The material available for examination were five males and several females, part of Wood's type material. They were examined in the Zoological division of the British Museum, London.

The body is gradually attenuated anterior to the genital opening. Buccal cavity weakly developed. There is no cervical papillae. The head measures 17 microns to 22 microns in breadth. Excretory pore is 286 microns to 308 microns from the cephalic end. The oesophagus is simple and measures 893 microns to 988 microns in length. The cuticle is transversely striated, and there is a broad cuticular flange on the right lateral side of the worm in both males and females. It measures 26 microns to 35 microns in its widest breadth anterior to the bursa in the male. The flange extends anteriorly beyond the middle of the worm and then fades away. In the female this flange measures 26 microns to 44 microns in its widest diameter and it gradually narrows posteriorly until at the level of the anal opening the cuticle becomes of the same breadth as the other (left) side. The flange also narrows slightly at the region of the vulva.

The male measures 6.315 mm. to 7.828 mm. in length and 132 microns to 140 microns in maximum breadth anterior to the bursa. The bursa is fairly large and asymmetrical and there is no distinct dorsal lobe. The right lobe is shorter than the left. The ventro-ventral ray is narrow and separated from

the latero-ventral which is the widest of all the other rays proximally but gradually tapers to a narrow distal end. It diverges for more than its distal two thirds from the externo-lateral. The latter is short and ends bluntly some distance from the edge of the bursa and is slightly narrower than the latero-ventral ray. The medio-lateral is narrower than the externo-lateral and it diverges from it for the most part of its length. The angle between the externo-lateral and medio-lateral is smaller than the angle between the externo-lateral and latero-ventral. The postero-lateral ray is narrower than the medio-lateral, diverges from it for the whole of its length and gradually tapers to a narrow point reaching the edge of the bursa. The angle between the postero-lateral and the medio-lateral is equal to the angle between the latero-ventral and externo-lateral. The externo-dorsal ray is quite broad, as broad as the latero-ventral in their proximal ends. The externo-dorsal ends in a rounded tip very close to the edge of the bursa. The dorsal ray is long and divides at about half its total length into two long branches, the right one is shorter than the left; each of these branches ends in two small divisions. The dorsal ray measures 132 to 145 microns in length. the undivided main stem measures 66 microns to 84 microns, the long (left) stem measures 66 microns to 70 microns, the short (right) stem measures 57 microns to 66 microns in length.

The spicules are equal in size and similar in shape. They measure 211 microns to 322 microns in length. They are broad at their anterior half, but narrow in the posterior half and then terminate in rounded narrow ends. Each possesses ventrally at the beginning of the posterior half a backwardly directed narrow piece the tip of which is sharply pointed, that of the left spicule is longer and takes origin more anteriorly than that of the right spicule.

The gubernaculum measures 136 microns to 154 microns in length. It is bent ventrally and consists of a narrow elongated piece with the edges parallel to each other, it ends in a narrow point anteriorly and is rounded posteriorly.

The females of this species and the following one *A. australis* were mixed together and could not be differentiated from each other. There are, however, certain females with their uterine eggs smaller in size than the others. They are numbered 1, 3 and 8 in the table for the measurements of the different parts, the intrauterine eggs in this case measure 88 microns to 97 microns × 44 microns to 53 microns; in two cases of these i. e. n.os 3 and 8 there is a fairly large anterior lip to the vulva in no. 3 and a small one in no. 8 and none is present in no. 1, and the rest of the females examined. So it may be assumed that some of the females have smaller ova than the others and these females may or may not have anterior lips to the vulva. The other group have larger intrauterine eggs measuring 123 to 149 microns × 52 to 75 microns and have no anterior lip to the vulva. Apart from the above mentioned differences the following description applies to both. They measure 10.127 mm. to 13.19 mm. in length and 176 microns to 211 microns in maximum breadth in the region of the vulva, not including the breadth of the lateral cuticular flange, which is present only on the right side of the worms as in the case of the male worms. The vulva is a transverse slit measuring 110 to 141 microns in length and is sometimes provided with an anterior lip which varies in size from a fairly large one to a very small one. The vulva is situated at a distance of 3.116 mm. to 4.997 mm. from the tip

of the tail, that is to say at about the junction of the middle with the posterior thirds of the body length. The uteri are divergent and there are well developed ovejectors, the combined lengths of which is 330 to 427 microns. The anterior ovary bends backwards at 1.185 to 1.821 mm. from the head end and the posterior ovary bends forwards at 290 to 703 microns from the tip of the tail. The posterior end of the worm narrows gradually from the point where the posterior ovary turns forwards. The anus is at a distance of 70 to 88 microns from the tip of the tail.

Habitat and host: stomach and intestines of the Wallaby *Macropus woodwardi.*

Asymmetricostrongylus australis (Wood, 1930) Nagaty, 1932.

(Pl. 3, figs. 1-3).

The material available for examination were two males and several females, part of Wood's type material. They were examined in the Zoological division of the British Museum, London.

The body is gradually attenuated anterior to the genital opening. Buccal cavity weakly developed. There is no cervical papillae. The head measures 22 to 26 microns in breadth. Excretory pore is from 277 to 370 microns from the cephalic end. The oesophagus is simple and measures 874 to 931 microns in the male and 1.008 to 1.153 mm. in the female. The cuticle is transversely striated. There is a broad cuticular flange on the right lateral side of the worm in both males and females. It measures 18 microns in its widest breadth anterior to the bursa. The flange fades gradually about the middle of the worm. In the females this flange measures 26 to 41 microns in its widest breadth; it gradually narrows posteriorly until at the level of the anal opening it becomes of the same breadth as the other side. It also narrows slightly at the region of the vulva.

The male measures 8.075 to 9.063 mm. in length and 110 to 132 microns in maximum breadth anterior to the bursa. The bursa is fairly large and asymmetrical and there is no distinct dorsal lobe. The right lobe is shorter than the left and accordingly the rays of the one side are shorter than the others'. The ventro-ventral ray is widely separated from the latero-ventral and its tip reaches the edge of the bursa. Latero-ventral and externo-lateral are parallel to each other and of about equal breadth, their tips reach the edge of the bursa. Medio-lateral diverges from the externo-lateral and is broader than any of the other rays, its tip reaching the edge of the bursa. Postero-lateral is widely separated from the medio-lateral and is of about the same breadth as the ventro-ventral. It is in the middle of the distance between the medio-lateral and externo-dorsal rays. The dorsal ray is long and divides at a little longer than its proximal third into two long branches, the right one is shorter than the left; each of these branches ends in two papilla-like divisions. The dorsal ray measures 176 to 189 microns in length, the undivided main stem measures 66 to 83 microns; the left (long) division measures 110 microns, the right (short) division measures 83 or 96 microns.

The spicules are equal in size and similar in shape. They are large and broad and very dark brown in colour. Each possesses a narrow chitinised band about one third of the whole length of the spicule, tapering posteriorly

into a very thin part; the right band of the right spicule is wavy in outline. The spicules measure 211 to 220 microns including these narrow bands. Both spicules are bent ventrally and the right spicule proper has a rounded posterior extremity.

The gubernaculum measures 110 microns in length and viewed dorsally it comprises a band with both lateral edges parallel, viewed laterally it appears bent with the convexity dorsalward; it tapers towards the anterior and the posterior ends.

The females of this species were mixed with these of the preceding one and could not be separated from them. They are described with *A. dissimilis*.

Habitat and host: stomach and intestine of the Wallaby *Macropus woodwardi.*

DISCUSSION

Firstly concerning *A. asymmetricus*. Cameron's description of this species is rather inadequate besides a few mistakes which are most probably due to misprint. This author gives the length of the oesophagus as 0.1 to 0.15 mm. long while in the type specimens I have examined, it measures 760 to 955 microns in length. Wood's measurement of this organ (0.9-1.15 mm.) more or less agree with mine.

The length of the male is given by Cameron as 2.5 mm. and the breadth as 0.25 mm. My measurements of Cameron's types are 7.505 mm. in length by 79 to 88 microns in maximum breadth anterior to the bursa. Wood gives the length of the male as 7 mm. which corresponds to mine. Cameron states in his description of the bursa that the rays of the right side are stouter and longer than those of the left side. This is not the case because I have found in this and the two other known species of the genus that the right lobe is slightly smaller than the left and consequently the rays of this side are shorter, contrary to Cameron's statement. No mention of the cuticular flange on the right side of the worms are mentioned by the latter author in his description of the species but is mentioned by Wood, who states that it exists on the same side as the larger half of the bursa, but does not mention which side is the larger lobe of the bursa to be found. As is mentioned above concerning the description of this flange it is found on the right side of the body only where the smaller lobe is also found contrary to Wood's statement. The size of the spicules and gubernaculum are not mentioned neither by Cameron nor later by Wood.

The female worm measures approximately 11-13 mm. in length by 154 microns in maximum breadth. These measurements are given by Cameron as 8-10 mm. by 0.3 mm., and by Wood as 12-13 mm. The vulva is stated by the former author to be situated in the posterior fifth of the body, while I have found it in type specimens at about the junction of the middle with the posterior thirds of the body.

Secondly, concerning *A. dissimilis* and *A. australis*, Wood gives four figures to illustrate the characters of these species. The legend to the first of these (Fig. 7 of Wood) is: « *Trichostrongylus dissimilis*. Spicules », and in fact represent the spicules and gubernaculum of this species. The legend of the second figure (Fig. 8 of Wood) is: « *Trichostrongylus dissimilis*. Bursa and

Gubernaculum ». In the copy I received of this paper the words « *dissimilis* » and « Bursa and Gubernaculum » are crossed and instead « australis » and « spicules » are replaced in ink respectively. In fact this figure represent the spicules and gubernaculum of *A. australis*. With both figures (7 and 8 of Wood) there is a line marked (0.1 mm.), to represent the magnification. By no means this magnification is correct as can be easily made out by comparing the length of the line with that of the spicules which are mentioned in the text of Wood and the present author. The legend of the third figure (Fig. 9 of Wood) is: « *Trichostrongylus australis*. Spicules ». This is in fact the bursa copulatrix and gubernaculum of *A. australis*. The legend of the fourth figure (Fig. 10 of Wood) is: « *Trichostrongylus australis*. Bursa and Gubernaculum ». This figure represents these organs of *A. dissimilis* and not *A. austiatis* judging by the bursal formula and especially by the shape of the dorsal ray.

Wood states in the text, that the cuticular flange of *A. dissimilis* and *A. australis* is found on the right side of the body where the large lobe of the bursa is found. The first part of this statement is correct but the second is not, because the right lobe of the bursa is the smaller of the two in all these species of the genus according to my observations of types; furthermore Wood in his figures of the two copulatory bursae of *A. australis* and *A. dissimilis* (Figs 9 and 10 of Wood), draws the cuticular flange on the same side as the small lobe of the bursa judging by the shorter branch of the dorsal ray which is towards the right side as can be clearly seen from these figures.

DIAGNOSIS OF THE GENUS

Libyostrongylus Lane, 1923.

Delicate *Trichostrongylidae* with fine transverse cuticular striation; cuticle of cephalic end apt to be raised in swellings. Oral cavity minute, oesophagus simple. Male bursa voluminous, closed dorsally, with dorsal part elongated and apparently sometime forming a short dorsal lobe. Dorsal rays fused for a considerable portion of their length, each ray having three terminals, variously arranged. Externo-dorsal ray not reaching the dorsal margin. Medio-lateral, externo-lateral and latero-ventral rays lie mainly parallel, the dorso-lateral and the delicate ventro-ventral tending away from these intermediate ones. Spicules equal, similar, pigmented, each with expanded base, stout shaft, slightly curved apex acutely pointed in certain aspects and a fine, dorso-posteriorly springing spine in its posterior half. Posterior cloacal wall somewhat thickened into an imperfectly differentiated, lightly pigmented accessory piece curved antero-posteriorly into a marked ventral concavity. Vulva lies in the posterior fifth, the short vagina immediately entering into two opposed uteri.

TYPE SPECIES: — *L. douglassii* (Cobbold, 1882) Lane, 1923.
OTHER SPECIES: — *L. hebrenicutus* Lane, 1923.

DESCRIPTION OF THE SPECIES

Libyostrongylus douglassii (Cobbold, . 1882) Lane, 1923.
(Pl. 3. figs. 1-6).

Synonyms: — *Strongylus douglassii* Cobbold, 1882.
Strongylus douglasi Gedoelst, 1911.
Trichostrongylus douglasi (Cobbold, 1882) Theiler & Robertson, 1915.
Ornithostrongylus douglasi (Cobbold, 1882) Travassos, 1918.

The material available for examination was as follows: —

1) Cobbold's type specimens which consisted of one male and one female mounted on a glass slide, and kept in the Royal College of Surgeons, London.
2) Several worms from the crop of an Ostrich collected by Dr. H. A. Baylis and kept in the British Museum (Natural History) London.

The worms do not taper gradually anterior to the genital opening as in the case of members of the genus *Trichostrongylus* but they possess a uniform thickness up to the junction of the intestine with the oesophagus, when the body then begins to taper anteriorly to the head end. The head end measures 26 to 31 microns in diameter. The excretory pore is 229 to 330 microns. The cuticle is transversely striated and is inflated in many places especially in the region of the vulva in the female. The oesophagus is simple widening sligthly towards the posterior end and measures 330 to 491 microns.

The male measures 3.23 to 4.73 mm. in length and 101 to 123 microns in maximum breadth. The bursa is small in comparison with the breadth of the worm and consists of two lateral lobes and a small dorsal lobe. The bursa is disconnected ventrally but continuous dorsally and the bursal formula is as follows: ventro-ventral ray is only sligthly separated from the latero-ventral. Latero-ventral, externo-lateral and medio-lateral are close together and are of about the same thickness. Postero-lateral is of about the same breadth as the ventro-ventral and is divergent from the medio-lateral, forming a similar angle as that formed by the ventro-ventral and latero-ventral. The tips of the latero-ventral and externo-lateral are nearest together than any of the other rays. Externo-dorsal ray is of about the same breadth as that of the postero-lateral but is shorter in length, not reaching the edge of the bursa. The dorsal ray is remarkable in that it possesses a main long stem of about the same thickness as the externo-dorsal. This stem divides into two divisions at about one half or slightly less than half of the total length of the dorsal ray. These divisions send off two narrow external branches one on either side, which taper towards their distal ends and reach the tip of the bursa at the junction of the lateral lobes with the dorsal one.

The inner branches of the dorsal ray each possesses two pairs of shorter tapering ones, the innermost pair of which are longer than the others and almost reach the tip of the dorsal lobe, while the outer pair is shorter and

do not reach the edge of the dorsal lobe. Thus the dorsal ray possesses six terminal branches.

A pair of prominent lateral pre-bursal papillae is present anterior to the bursa.

The spicules are equal in length and similar in shape. They measure 123 to 149 microns in length. The spicules show longitudinal grooves and eminenses and possess anteriorly a button-like protuberance. They end distally into a tapering piece which possess a blunt rounded tip. There is another long tapering sharply pointed piece which springs from the dorsal surface of the spicules at about the junction of its middle with the posterior thirds of its length.

The gubernaculum is a slightly chitinised ventrally bent piece that measure 62 to 70 microns in length.

The female measures 3.99 to 6.137 mm. in length and 132 microns in maximun diameter in the region of the vulva. The latter is a transverse slit to the longitudinal axis of the body and measures 48 microns in length and is situated at 800 to 893 microns from the tip of the tail, that is to say in the posterior sixth or seventh of the total length of the worm. The uteri are divergent and there are well developed ovejectors, the combined lengths of which are 228 to 308 microns. The posterior ovary bends forwards at 189 to 330 microns from the tip of the tail. The tail measures 66 to 75 microns and is always bent ventrally. The diameter of the body at the region of the anus is 30 to 52 microns. The body tapers gradually from the loop of the posterior ovary to the tip of the tail which is bluntly rounded.

Libyostrongylus hebrenicutus Lane, 1923.

(Pl. 1, figs. 1-5).

The material available for examination was as follows: —

1) Types, from the stomach and duodenum of a gorilla, two males and three females were kept in the Royal College of Surgeons, London.
2) Cotypes, from the stomach and duodenum of a gorilla, one male and one female were kept in the Zoological Department of the British Museum (Natural History), London.

The worms are small and slender. The body is gradually attenuated anterior to the genital opening. Buccal cavity very small. No cervical papillae present. The head measures 13 microns in diameter. The excretory pore is situated at 330 microns from the cephalic end. The cuticle is transversely striated and is often inflated at the region of the head and the vulva. The oesophagus is simple 506 to 519 microns in length.

The male measures 8.132 mm. to 8.155 mm. in length and 110 microns to 132 microns in maximum breadth anterior to the bursa. The bursa is voluminous in comparison to the length and breadth of the parasite. The bursa is united dorsally but disconnected ventrally. The dorsal part is slightly differentiated into a dorsal lobe. The bursal formula is as follows: Ventro-ventral ray is thin and makes an angle of about 30° with the latero-ventral and its tip reaches the edge of the bursa. Latero-ventral broad and close to the laterals, it is of about the same breadth as the laterals. Latero-ventral, externo-lateral and

Number of specimens examined of each species.	Sex.	Length in mm.	Diameter of head in μ.	Distance of excretory pore from head end in μ.	Length of oesophagus in μ.	Distance of vulva from tip of tail in μ.	Length of slit of vulva in μ.	Diameter of body at region of vulva in μ.	Combined lengths of ovejectors in μ.	Size of ova in μ.	Distance between bend of posterior ovary and tip of tail in μ.	Distance between bend of anterior ovary from head end in mm.	Length of the tail in μ.	Diameter of body at region of anus in μ.	Diameter of body anterior to bursa in μ.	Length of left spicule in μ.	Length of right spicule in μ.	Length of gubernaculum in μ.	Length of whole dorsal ray in μ.	Length of the stem of dorsal ray before division in μ.	Length of the short branch of the dorsal ray in μ.	Length of the long branch of the dorsal ray in μ.	Breadth of the cuticular lateral flange in μ.	
1	♂	7.505	22	—	760	—	—	—	—	—	—	—	—	—	88	185	185	114	88	—	—	—	—	*Asymmetricostrongylus asymmetricus.* Type material.
2	♂	7.505	22	—	814	—	—	—	—	—	—	—	—	—	79	185	185	110	88	—	—	—	—	
3	♀	11.21	22	—	902	3800	110	154	418	136×84	760	1.662	330	66	—	—	—	—	—	—	—	—	—	
4	♀	13.205	22	360	954	3800	110	154	382	136×75	912	1.235	352	66	—	—	—	—	—	—	—	—	—	
1	♂	7.828	22	—	931	—	—	—	—	—	—	—	—	—	140	250	250	145	136	66	—	—	—	*A. dissimilis.* Type material
2	♂	7.714	22	—	893	—	—	—	—	—	—	—	—	—	140	276	276	145	145	84	57	66	26	
3	♂	6.315	17	286	912	—	—	—	—	—	—	—	—	—	132	211	211	136	132	66	62	66	30	
4	♂	7.657	17	308	950	—	—	—	—	—	—	—	—	—	140	322	322	154	—	—	—	—	35	
5	♂	7.41	22	286	988	—	—	—	—	—	—	—	—	—	132	237	237	145	132	—	66	70	—	
1	♂	8.075	26	—	931	—	—	—	—	—	—	—	—	—	132	211	211	110	176	66	96	110	—	*A. australis* Type material
2	♂	9.063	22	352	874	—	—	—	—	—	—	—	—	—	110	220	220	110	189	83	83	110	—	
1	♀	12.768	26	321	1144	4427	114	185	396	88×48	629	—	216	79	—	—	—	—	—	—	—	—	31	Mixed females of *A. dissimilis* and *A. australis.* Type material
2	♀	10.127	22	277	1008	3116	110	176	330	132×66	290	—	220	79	—	—	—	—	—	—	—	—	44	
3	♀	12.996	26	—	1047	4560	132	176	396	88×48	576	1.767	220	71	—	—	—	—	—	—	—	—	26	
4	♀	11.456	22	317	1153	3800	123	185	396	141×57	396	1.373	273	88	—	—	—	—	—	—	—	—	44	
5	♀	13.49	22	321	1140	4218	128	176	396	132—136 × 52-66	—	1.185	246	88	—	—	—	—	—	—	—	—	—	
6	♀	12.331	22	339	1078	3876	123	176	387	141×75	374	1.355	246	75	—	—	—	—	—	—	—	—	—	
7	♀	13.148	22	330	1056	4218	141	176	409	136×61	352	1.32	246	79	—	—	—	—	—	—	—	—	39	
8	♀	13.49	22	370	1140	4997	119	211	427	88-97 × 44—53	703	1.824	251	75	—	—	—	—	—	—	—	—	31	
9	♀	10.716	22	317	1100	3857	114	176	339	132—136 × 62—66	453	1.408	251	79	—	—	—	—	—	—	—	—	44	
1	♂	3.23	26	—	330	—	—	—	—	—	—	—	—	—	123	149	149	—	110	48	—	—	—	*Libyostrongylus douglassii* Type material
2	♀	3.99	26	—	462	800	—	132	268	—	189	—	66	30	—	—	—	—	—	—	—	—	—	
3	♀	4.921	26	—	—	880	—	132	228	—	330	—	75	52	—	—	—	—	—	—	—	—	—	
1	♂	4 731	31	—	494	—	—	—	—	—	—	—	—	—	119	145	145	—	—	—	—	—	—	*L. douglassii*
2	♂	4.028	26	229	—	—	—	—	—	—	—	—	—	—	101	123	123	62	—	—	—	—	—	
3	♂	4.674	31	—	494	—	—	—	—	—	—	—	—	—	119	145	145	70	132	62	—	—	—	
4	♀	6.137	31	330	494	893	48	132	308	—	286	—	75	44	—	—	—	—	—	—	—	—	—	
1	♂	8.455	—	—	506	—	—	—	—	—	—	—	—	—	110	198	198	92	—	—	—	—	—	*L. hebrenicutus* Type material.
2	♂	8.132	13	—	519	—	—	—	—	—	—	—	—	—	132	206	206	88	176	—	—	—	—	
3	♀	9	—	—	—	1900	53	110	550	—	330	—	101	40	—	—	—	—	—	—	—	—	—	
4	♀	10.355	13	330	—	1995	—	176	462	—	396	—	149	61	—	—	—	—	—	—	—	—	—	

medio-lateral are parallel to and close to each other, except at their tips where they diverge and their tips reach the edge of the bursa. Tips of externo-lateral and medio-lateral are closer together than any of the others. Postero-lateral ray is close to the medio-lateral till about half its length and then diverges dorsally from it in its distal half. Externo-dorsal ray is of about the same thickness as the ventro-ventral and its tip does not quite reach the edge of the bursa. The dorsal ray measures about 176 microns in length and gives off at about its middle, 88 microns from the base of the main stem of the dorsal ray two large branches, one on each side; the main stem then becomes reduced in diameter to about half the original one before these branches were given off. It ends after a short course 128 microns from the base of the main stem, by dividing into two pairs of very unequal branches. The two outer ones are very short and the two inner ones are long, reaching the edge of the bursa, the four branches are sharply pointed.

The spicules are weakly chitinised and are of the same length and shape. They measure 198 to 206 microns in length and each have a narrow sharply pointed process which springs from the dorsal surface at about the junction of the third and posterior fourth of the length of the spicule and is direted posteriorly. The spicules are slightly bent ventrally.

The gubernaculum is very weakly chitinised and measures 88 to 92 microns in length. It is sickle-shaped when viewed laterally, the handle of the sickle is directed anteriorly, the cutting part posteriorly forming a concavity ventrally and ending posteriorly in a crooked, thin and ill-defined part.

The female measures from 9 to 10.355 mm. in length and 110 to 176 microns in maximum diameter at the region of the vulva. The latter is a transverse slit to the longitudinal axis of the worm, measures 55 microns in length and is situated at a distance of 1.9 to 1.995 mm. from the tip of the tail that is to say is situated in the posterior fifth of the total length of the body. The uteri are divergent and there are well developed ovejectors which measure 462 to 550 microns in length. The posterior ovary bends forwards at 330 to 396 microns from the tip of the tail. The anus is situated at 101 to 149 microns from the tip of the tail. The diameter of the body at the region of the anus is 39 to 61 microns. The body tapers gradually and regularly from the loop of the posterior ovary to the tip of the tail which is fairly rounded.

Habitat and hosts. In the stomach and duodenum of the Gorilla

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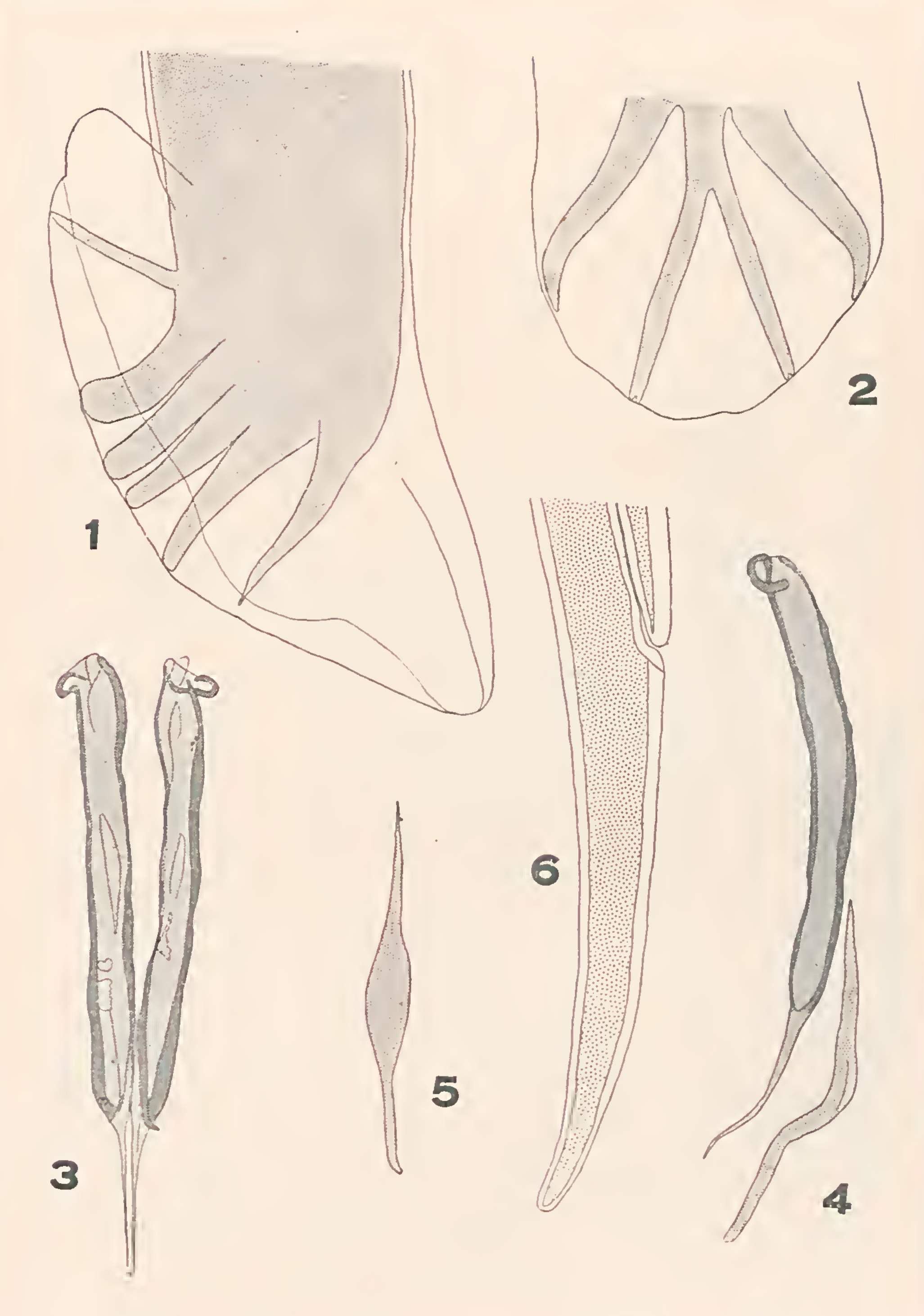
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Plate 1

Asymmetricostrongylus asymmetricus (Cameron, 1926) Nagaty, 1932.

Fig. 1 — Male bursa, left lateral view.
Fig. 2 — Male bursa, dorsal view showing dorsal and externo-dorsal rays only.
Fig. 3 — Spicules, dorsal view.
Fig. 4 — Left spicule and gubernaculum, left lateral view.
Fig. 5 — Gubernaculum, dorsal view.
Fig. 6 — Posterior end of female, right lateral view.

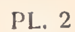


Nagaty: The Genera *Asymmetricostrongylus* and *Libyostrongylus*.

Plate 2

Asymmetricostrongylus dissimilis (Wood, 1930) Nagaty, 1932.

Fig. 1 — Male bursa copulatrix, left lateral view.
Fig. 2 — Dorsal and externo-dorsal rays, dorsal view.
Fig. 3 — Spicules, ventral view.
Fig. 4 — Gubernaculum, dorsal view.
Fig. 5 — Gubernaculum, left lateral view.
Fig. 6 — Posterior end of female, dorsal view.



1 2 3 4 5 6

Nagaty: The Genera *Asymmetricostrongylus* and *Libyostrongylus*.

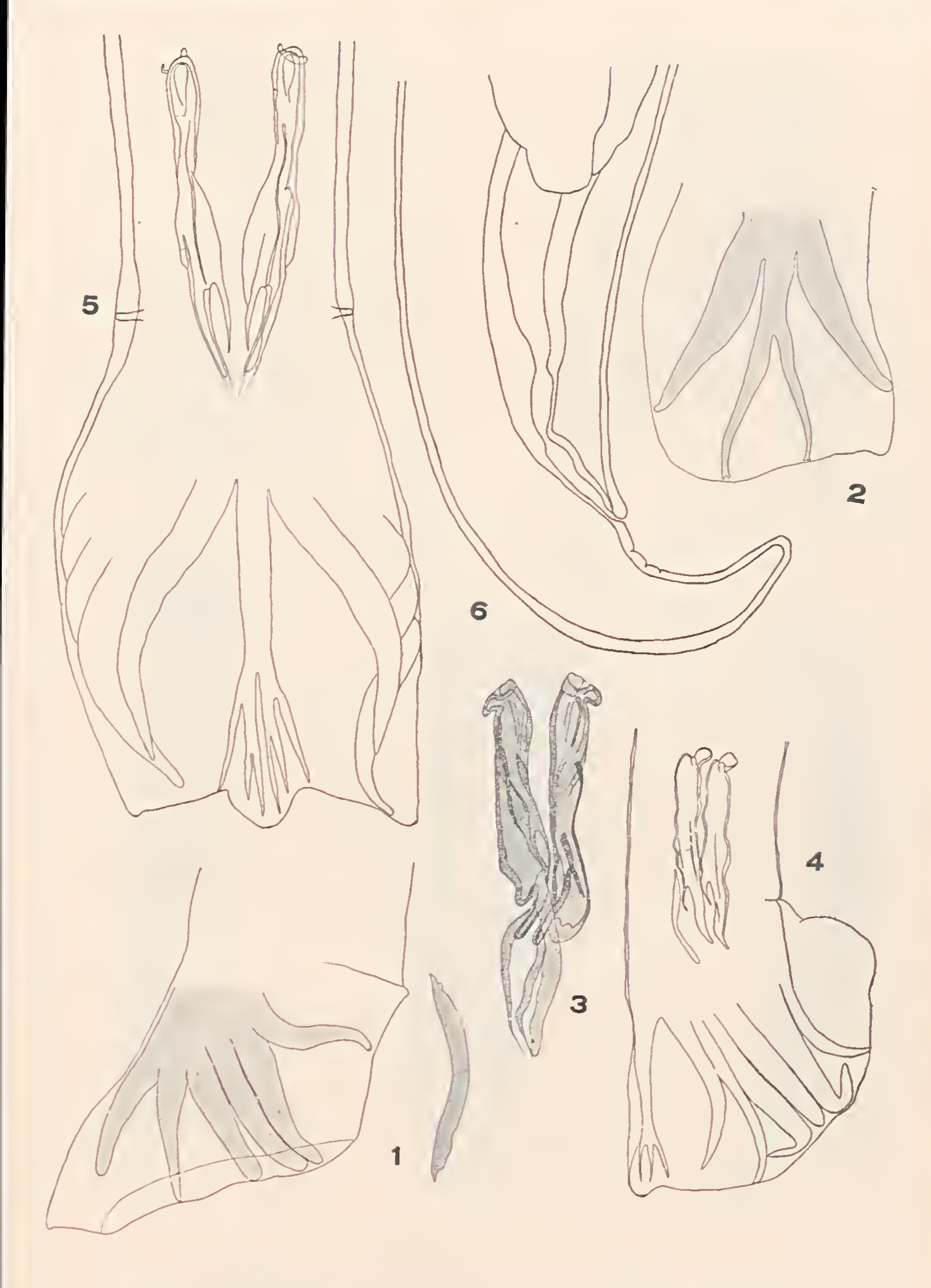
Plate 3

Asymmetricostrongylus australis (Wood, 1930) Nagaty, 1932.

Fig. 1 — Male bursa, right lateral view and gubernaculum, left lateral view.
Fig. 2 — Male bursa, dorsal view showing dorsal and externo-dorsal rays only.
Fig. 3 — Dorso-lateral view of spicules and gubernaculum.

Libyostrongylus douglassii (Cobbold, 1882) Lane, 1923.

Fig. 4 — Male bursa, spicules and gubernaculum, right latero-dorsal view.
Fig. 5 — Male bursa and spicules, dorsal view.
Fig. 6 — Posterior end of female, right lateral view. Cobbold's type.

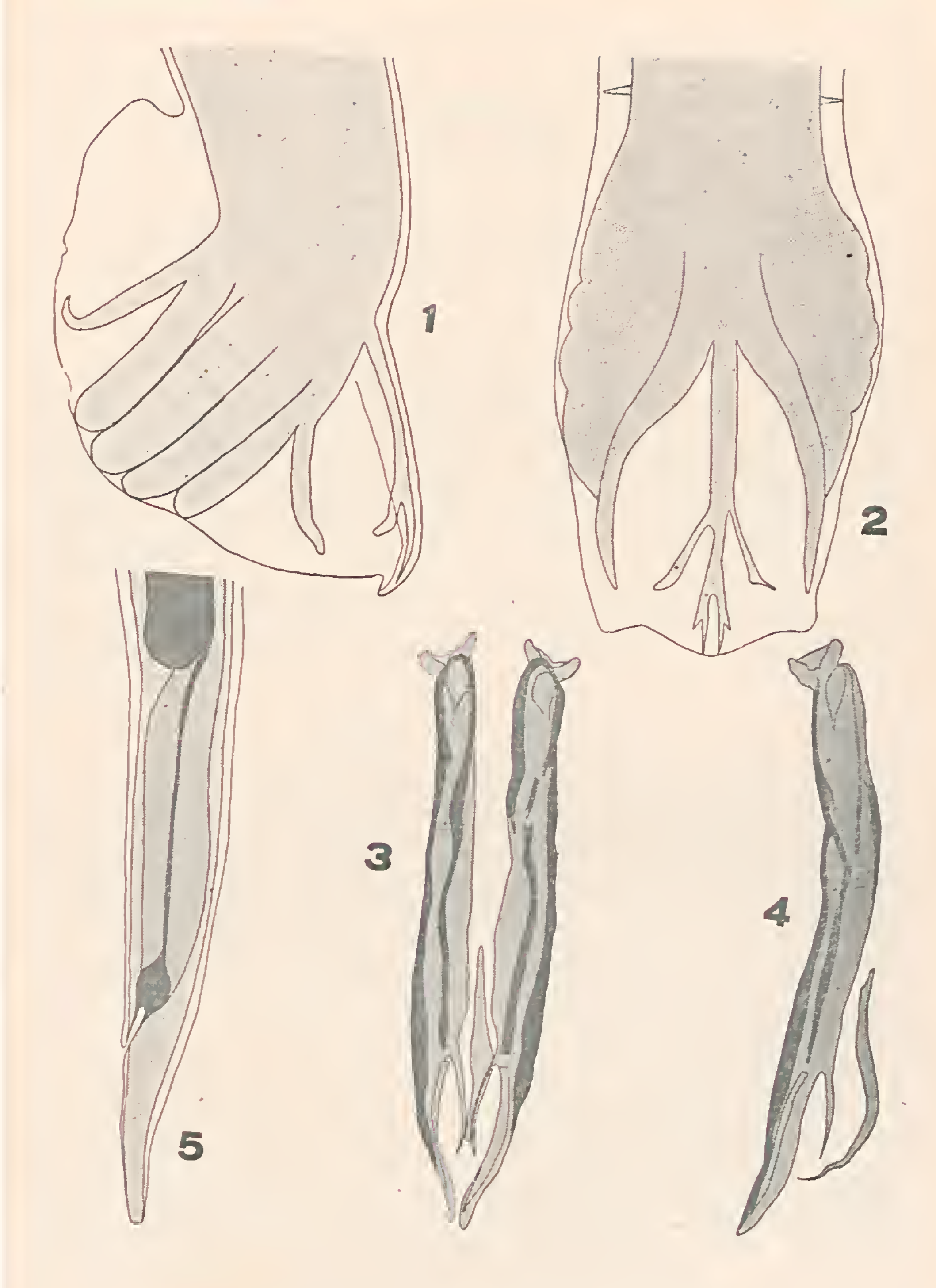


Nagaty: The Genera *Asymmetricostrongylus* and *Libyostrongylus*.

Plate 4

Libyostrongylus hebrenicutus Lane, 1923.

Fig. 1 — Male bursa, left lateral view.
Fig. 2 — Male bursa, dorsal view.
Fig. 3 — Spicules and gubernaculum, dorsal view.
Fig. 4 — Left spicule and gubernaculum, left lateral view.
Fig. 5 — Posterior end of female, left lateral view.



Nagaty: The Genera *Asymmetricostrongylus* and *Libyostrongylus*.

On two Cestodes recovered from a South African Kite

R. J. Ortlepp, M. A., Ph. D., D. Sc.

Helminthologist, Veterinary Research Laboratory, Onderstepoort, South Africa

[With 1 plate]

The helminths described below form part of the material obtained in connection with the South African Zoological Survey. The host was shot in the Pretoria district and the parasites were collected soon after the death of the host. When handed over to the writer the parasites had already been washed and cleaned and allowed to die in cold water. They were fixed and preserved in 70 % alcohol containing 5 % glycerine and the majority of the specimens remained fixed in an extended condition. A fair number of the first described species was obtained, the second species being represented by 5 specimens.

It affords the writer the greatest pleasure to name these species after the eminent helminthologist, Prof. Dr. Lauro Travassos, in appreciation of his valuable contributions towards the increase of our knowledge of helminthology.

Unciunia travassosi sp. nov.

This species was represented by about 50 specimens; they are relatively short, the majority being from 15 to 20 mm. long, the longest specimen, however, attained a length of 34 mm. They increase gradually in width towards the posterior end reaching their greatest breadth at about 2/3rds of their length; further back the breadth remains more or less constant; his maximum breadth may reach 1.3 mm. The strobila is built up of 50 to 80 segments, all of which are broader than long; those at the anterior end are five to six times as broad as long whereas the end segments are less than twice as broad as long. Ripe segments were unfortunately not present, but it is probable that when examined they will be found to be longer than broad.

The scolex is small and is only slightly constricted off from the rest of the strobila; it is dorso-ventrally flattened and has a transverse diameter of 0.37 mm. There were only 3 heads present and as they break off very easily it is probable that those missing were lost during the process of washing and cleaning. The rostellum is small and carried no hooks, although what appears to be scars were seen on its anterior end; if hooks are present they are very easily detached; in the extruded condition it is about 0.09 mm. long and about 0.045 mm. broad at its base; it tapers slightly to end in a slight swelling 0.06 mm. in diameter. The four suckers are weak and only slightly oval measuring 0.13 to 0.145 mm. across by 0.145 to 0.16 mm. long.

A neck is entirely absent, the first segments making their appearance immediately behind the head; these are about 0.29 mm. broad by about 0.05 mm. long. The genitalia begin to appear as dark staining masses of cells from about the 6th or 8th segment; they are situated towards the future poral side and in the anterior half of the segment; some 10 segments further back the testes make their appearance as dark staining dots in the posterior half of the segment; from the 25th to the 30th segment the segments become mature.

Mature segments (Fig. 1) are from 1 to 1.3 mm. broad by 0.65 to 0.79 mm. long. The genital pores, which alternate irregularly, are situated on a slight elevation in the anterior quarter of each segment; each leads into a cone-shaped genital chamber from whose base numerous straight needle-like cuticular hairs originate (Fig. 2); these may protrude through the genital aperture; they are from 0.05 to 0.065 mm. long. The genital ducts open into this chamber, the cirrus into its base and the vagina about midway on its posterior border; the cirrus when extruded pushes through the cuticular hairs and does not carry them outwards with it.

The pear-shaped cirrus sac is muscular and reaches but does not cross the ventral excretory canal; generally it lies transversely across the segment but contraction of the segment may cause it to be directed obliquely backwards and inwards; it is from 0.11 to 0.12 mm. long with a maximum thickness of 0.067 mm. The cirrus is densely spined and when extruded is 0.014 mm. thick; its posterior end forms a few coils inside the cirrus sac. The vas deferens, after crossing the excretory canal and nerve ring on its dorsal side, forms a mass of dense coils on the poral side of the ovary; a vesicula seminalis is absent, but the enlarged and coiled vas deferens, which is filled with sperms, may act in its stead. The testes of which there appear to be from 30 to 50 in each segment, are confined to the posterior half of the segment and are entirely posterior of the female glands: they form a single horizontal layer in the medullary parenchyma filling up the space between the ventral excretory canals; they are from 0.04 to 0.05 mm. high by about 0.03 mm. broad.

The vagina opens into the genital chamber posterior of but on the same level as the cirrus sac; it is muscular and passes inwards forming a gentle curve or a few undulations: after crossing the excretory canal and nerve ring on its dorsal side it enters a large bean-shaped receptaculum seminis 0.16 mm long by 0.058 mm. across: just behind it there is a kidney-shaped yolk gland, 0.115 mm. long by 0.08 mm. across, and between them there is a small rounded shell gland. The ovary is irregularly lobed and consists of two parts, namely an anterior larger part situated near the anterior margin of the segment, anterior to and mostly on the aporal side of the receptaculum seminis, and a much smaller posterior portion lying along the posterior margin of the receptaculum seminis; these two portions are connected to each other by a narrow isthmus passing across the inner end of the receptaculum. The anterior portion is about 0.3 mm. broad by 0.15 mm. long and the posterior portion 0.145 mm. broad by 0.1 mm. long.

As no ripe segments were present it was not possible to determine the nature and fate of the uterus. Sections of the oldest segments, however, revealed the presence of groups of darkly staining cells irregularly scattered in the parenchyma, and if these represent immature eggs then the uterus would appear to be very transitory.

The musculature is very poorly developed and in consequence the

segments are very easily detached; the longitudinal muscles consist of a thin layer of scattered muscle bundles each containing 2 to 5 fibres (Fig. 3); the layer itself is only from 0.015 to 0.024 mm. thick. Circular and transverse muscles are represented only by irregularly scattered fibres. The parenchyma itself is remarkable for its very vacuolated nature; it is bounded by a cuticle 0.015 mm. thick; the cortical parenchyma is about 0.055 mm. thick and the medullary parenchyma about 0.06 mm. thick.

The excretory system is represented by two fairly distinct longitudinal ventral canals having a diameter of about 0.04 mm.; these are united to each other by a transverse canal at the posterior end of the segment. Because of the vacuolated parenchyma it was not possible to determine the presence or absence of a pair of dorsal excretory canals.

Affinities: — Only one species of cestode has hitherto been referred to this genus, namely *U. trichocirrosa* Skrjabin, 1915, which was obtained from a *Polyborus* sp. from Paraguay. This species is very closely related to the form described above but differs from it in its smaller size (maximum length 11 mm.), its fewer segments (18 to 30), its end segments are twice as long as broad, its rostellum carries a small terminal sucker, its testes are fewer (30 to 35) and fill up the whole segment extending lateral of and anterior to the female glands, and finally it is provided with a characteristic chitinous spine at the base of the cirrus. These differences appear to the writer to be of sufficient importance that the writer's and Skrjabin's materials may be considered as representing distinct species.

Specific Diagnosis: — *Dilepidinae.* Small cestodes generally about 20 mm. long but may be 34 mm. long. Genital pores irregularly alternate, situated in anterior quarter of segment and leading into a cone-shaped genital chamber provided with long straight cuticular hairs: 30-50 tested in a single horizontal postovarian layer; cirrus spine absent. Ovary of two portions, a larger anterior and smaller posterior portion separated by a large receptaculum seminis. Uterus and eggs unknown.

HOST: — *Milvus migrans.*
LOCATION: — Small intestine.
LOCALITY: — Pretoria District (Petronella), Transvaal.

Types in the Helminthological Collection, Onderstepoort.

Idiogenes travassosi sp. nov.

Five specimens of this species were obtained, only two of which had scolices; one scolex had all its rostellar and most of its sucker hooks, the other had lost them all. All the specimens were well extended.

The entire worm, which reaches a length of 50 mm., is thin and fragile, gradually becoming thicker posteriorly. The thickness of the strobila just behind the head is 0.13 mm. and at the posterior end 0.5 to 0.6 mm. The scolex is small and measures 0.23 mm. across; its rostellum is large and at the level of the hooks has a diameter of 0.1 mm. The suckers are weakly muscular and somewhat rounded with a diameter of 0.035 to 0.04 mm.

The rostellum measuring 0.105 mm. across carries a double row of typical

hammer-shaped hooks, those of the anterior row being 0.011 mm. long and those of the posterior row are 0.009 mm. long; there are 160 hooks. Most of the sucker hooks have been lost but sufficient are present to show that they are arranged in 6 to 8 rows and that they are 0.003 to 0.004 mm. long. The base of the rostellum is studded with numerous very minute spines, these forming a collar round this organ. The neck is short and at the most may be 0.3 mm. long. The first segment may be ten to twelve times as broad as long (0.174 mm. by 0.015 mm.); posteriorly the relations change so that when mature the segments are more or less square; towards the posterior end the segments increase further in length so that when ripe they are about twice as long as broad. Altogether each strobila has about 180 segments.

The genital organs make their first appearance at between the 50th and 60th segment and the first testes become differentiated about 30 to 35 segments further back; from about 115th segment the segments become mature and remain so for about 20 segments after which the genital glands begin to disappear and the uterus appears. The genital apertures are all unilateral and are situated just anterior to the middle of the segment.

Mature segments are from 0.15 to 0.46 mm. broad by 0.435 to 0.45 mm. long (Fig. 4). The ovary is centrally placed and is provided with two wings joined by a narrow isthmus anterior of the receptaculum seminis. Each ovarian part is somewhat oval and may be smooth or slightly lobed, and measures about 0.06 by 0.08 mm.; between them there is a conspicuous and rounded receptaculum seminis measuring about 0.05 mm. in diameter. The yolk gland may be rounded or slightly lobed, 0.058 to 0.067 mm. in diameter and is generally centrally placed behind the ovary, but it may be shifted slightly towards the pore side by the receptaculum seminis. The vagina is remarkable for its robustness and convolutions and its lumen stains darkly in toto mounts and in sections; it is muscular throughout and the distal portion of its lumen is lined by minute spines. From the ovary it passes forwards, making several irregular convolutions and then passes obliquely forwards and outwards after which it runs more or less parallel to the cirrus sac to open to the exterior immediately ventral of the cirrus sac. The cirrus sac is a large and club-shaped muscular organ extending obliquely from the genital pore to almost the anterior corner of the opposite side reaching the anterior margin of the segment; it, however, does not cross the opposite excretory canal; it is about 0.3 mm. long with a maximum thickness of 0.073 mm. The cirrus is exceedingly long, reaching a length of 1.5 mm. by 0.01 mm. thick; when not extruded it is telescoped inside the cirrus sac; it is covered by numerous spines 0.007 mm. long. The first portion of the vas deferens forms a few coils inside the cirrus sac and after emerging it is heavily coiled, the coils passing backwards parallel to the excretory canal up to the level of the ovary. The testes are rounded 0.04 to 0.045 mm. in diameter and are arranged in a single horizontal layer behind and lateral of the ovary; they are from 15 to 20 in number.

The uterus makes its appearance from about the 135 to 140 segment, and from the earliest stage assumes its characteristic inverted U shape (Fig. 5); it extends from the level of the ovary to the posterior margin of the segment and its sides are slightly lobed; the remains of the receptaculum persists between its limbs. Soon after the appearance of the uterus a darkly staining mass of cells appears just anterior of the uterus; these multiply and

eventually form a pillar-like paruterine organ indenting the anterior margin of the uterus; in no segment had eggs penetrated into it.

The eggs in the oldest segments were still immature and consequently no data regarding them can be given; it is possible that they mature only after the segments are shed and that only then do they pass into the paruterine organ.

The musculature is not strongly developed; there is a single layer of longitudinal muscles represented by scattered isolated fibres in the cortical parenchyma; these fibres are more numerous towards the medulla and lateral margins of the segments; circular muscles are represented by a thin and very indistinct layer of single fibres immediately interior of the longitudinal muscles.

The excretory system appears to consist of a single pair of excretory vessels joined to each other at the posterior end of each segment. A dorsal pair appears to be absent. The ventral vessels have a diameter of 0.025 by 0.015 mm. and they and the nerve cord are crossed by the genital ducts on their dorsal side.

Affinities: — Two species of this genus have been described from birds of prey, namely *Idiogenes flagellum* (Goeze) and *I. horridus* (Fuhrmann) var. *africanus* Hungerbuhler. Unfortunately a description of this African variety is not available, but the writer's materials differ from Fuhrmann's species in that the latter has only 7-9 testes. It differs from Goeze's species in that the latter is much smaller (2 cms.) narrower and has only 10 to 13 testes and in addition also has chalk bodies.

Specific Diagnosis: — *Idiogeninae.* Thin slender cestodes up to 50 mm. long. Rostellum with 160 hammer-shaped hooks in two rows, 0.009 and 0.011 mm. long. Suckers armed. Genital pores unilateral at about center of segment; genital ducts pass over nerve and ventral excretory canal. Cirrus sac large, extends obliquely forward to excretory canal of opposite side; cirrus relatively very long and spined. Testes 15 to 20 in a single horizontal layer behind and lateral of ovary. Vagina opens ventral of cirrus sac; muscular throughout and convoluted to ovary. Ovary median bilated. Receptaculum seminis present. Yolk gland somewhat rounded and behind ovary; uterus inverted U.

HOST: — *Milvus migrans.*
LOCATION: — Small intestine.
LOCALITY: — Pretoria District (Petronella), Transvaal.

Types in the Helminthological Collection, Onderstepoort.

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Plate 1

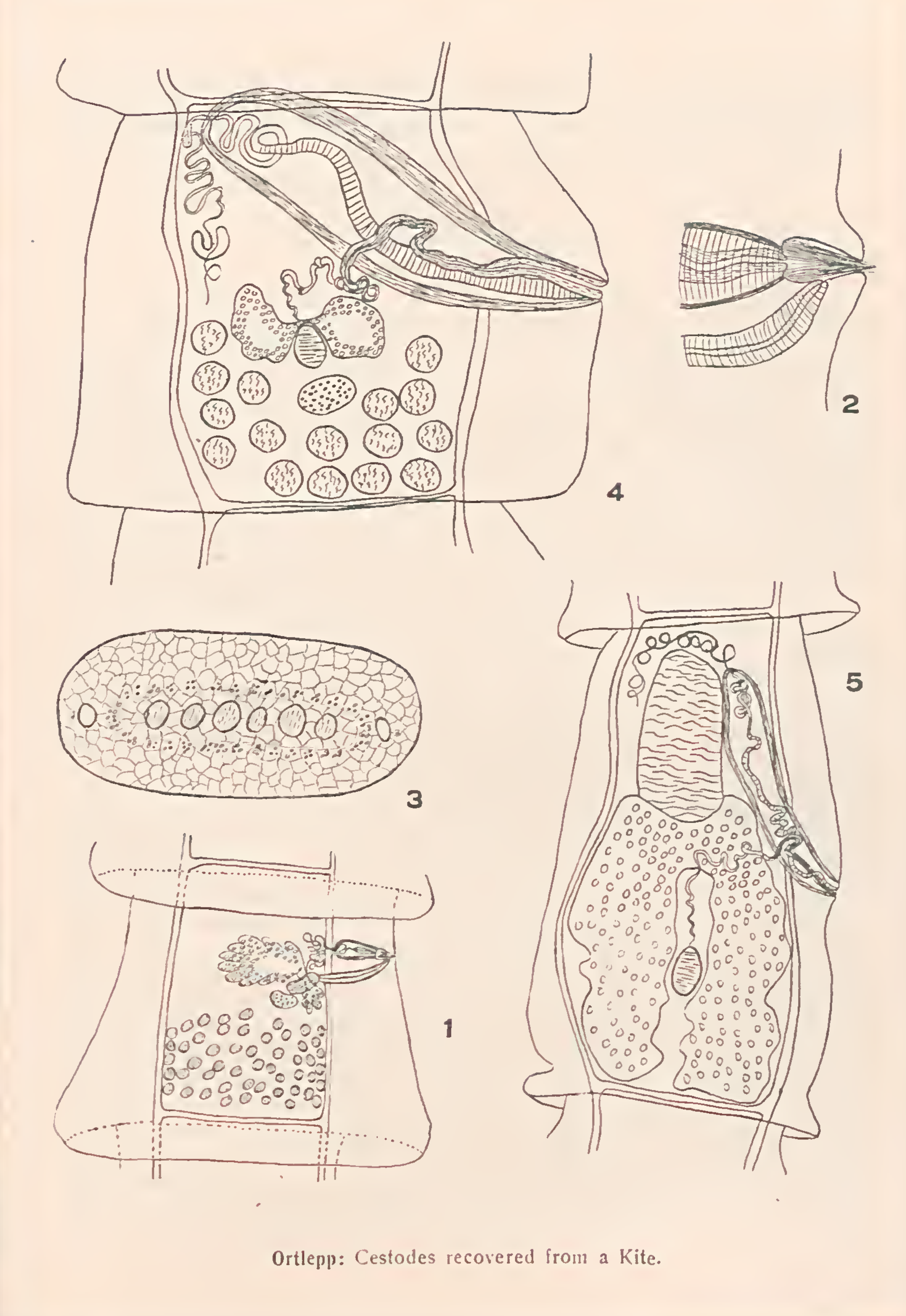
Fig. 1 — *Unciunia travassosi* sp. nov. Ventral view of mature segment.

Fig. 2 — *Unciunia travassosi* sp. nov. Genital chamber showing cuticular hairs and orifices of cirrus and vagina.

Fig. 3 — *Unciunia travassosi* sp. nov. Transverse section through posterior half of segment.

Fig. 4 — *Idiogenes travassosi* sp. nov. Ventral view of mature segment.

Fig. 5 — *Idiogenes travassosi* sp. nov. Ventral view of ripe segment.



Ortlepp: Cestodes recovered from a Kite.

Quelques préparations de système nerveux isolé employées en Physiologie et en Pharmacodynamie

Miguel Ozorio de Almeida, H. Moussatché et M. Vianna Dias
Instituto Oswaldo Cruz, Rio de Janeiro — Brasil

[Avec 1 planche]

La technique des organes isolés en survie fait des progrès constants; elle permet d'aborder des problèmes pour lesquels d'autres méthodes seraient impuissantes. En effet, l'organe isolé dans des conditions qui conservent ses fonctions pendant quelque temps, est soustrait à toute une série de facteurs et d'influences qui, d'ordinaire, rendent difficile l'analyse de certains aspects de son fonctionnement. Les phénomènes peuvent alors être observés ou provoqués dans un état de pureté qui révèle des aspects nouveaux. Dans certains cas même, la capacité d'agir sur l'organe sans l'entremise d'autres éléments déformateurs, nous offre la possibilité de trouver des phénomènes non encore connus. Tout cela explique que ce soit une des préoccupations essentielles de la Physiologie moderne celle de créer des techniques nouvelles d'isolement des organes ou de perfectionner les techniques existantes.

Nous ne ferons pas ici une énumération des méthodes dues à l'ingéniosité des physiologistes. Nous devons signaler, cependant, que, à côté des résultats féconds obtenus dans l'étude des fonctions de plusieurs organes ou systèmes organiques, il y a un certain retard en ce qui concerne plus spécialement les organes du système nerveux. C'est qu'ici les difficultés sont certainement plus grandes pour des raisons anatomiques, d'une part, pour des raisons physiologiques, d'autre côté. Le système nerveux des Vertébrés est protégé par un système osseux, reçoit son irrigation sanguine par une multitude de vaisseaux et tout cela rend beaucoup moins aisée la technique opératoire. En outre, il est particulièrement atteint par l'irritation ou l'inhibition produites par les lésions et extrêmement sensible aux traumatismes et aux modifications apportées à ses conditions normales de nutrition et de respiration.

Nous avons fait de nombreuses recherches sur plusieurs fonctions nerveuses en employant des préparations de système nerveux isolé, et nous sommes fermement convaincus que l'on peut espérer de grands progrès dans ce domaine. Nous nous sommes bornés jusqu'ici à la Grenouille, à quelques autres Batraciens et à quelques Lacertiliens. Ces techniques doivent, cependant, non seulement être multipliées pour pouvoir servir à des buts particuliers, comme aussi essayées sur plusieurs espèces animales, en profitant des avantages que des dispositions morphologiques spéciales peuvent apporter. Nous trouvons ici un domaine où la collaboration de la Zoologie avec la Physiologie promet d'être très féconde. Cela explique que nous ayons réservé cet essai pour le livre publié en honneur de notre cher ami Lauro Travassos, à qui nous nous

adressons toutes les fois que nous avons besoin de renseignements d'ordre zoologique.

Nous ne parlerons pas ici en détail des méthodes de perfusion du système nerveux, qui ont, d'ailleurs, donné des résultats du plus haut intérêt. Il suffit de rappeler la technique de la tête isolée, essayée par de nombreux physiologistes et mise au point par C. Heymans et de Sommer[1], qui a permis l'étude de plusieurs problèmes de régulation des grandes fonctions respiratoire et circulatoire.

Nous ne parlerons pas non plus des méthodes déjà essayées pour l'étude du système nerveux des quelques animaux invertébrés. Le lecteur pourra avoir une idée de cette question, en consultant le travail d'ensemble de Winterstein[2].

Chez plusieurs Vertébrés inférieurs (Batraciens, Lacertiliens, etc.) il est possible d'isoler le système nerveux central, en partie ou en totalité, en le laissant simplement rélié à une partie du système musculaire, sans avoir besoin d'employer des méthodes spéciales de perfusion ou de circulation artificielle.

Avant de faire l'exposé détaillé de ces méthodes, nous voudrions, cependant, dire quelques mots sur certaines méthodes de séparation de la moelle épinière des centres supérieurs. Sans être, à proprement parler, des techniques d'isolement, elles précèdent souvent les autres et, d'autre part, elles ont une grande valeur par elles-mêmes dans plusieurs recherches.

Méthodes de séparation de la moelle épinière des centres supérieurs chez la Grenouille. — C'est une notion banale en Physiologie que, quand on veut étudier les réflexes médullaires chez la Grenouille, il faut commencer par supprimer l'influence des centres encéphaliques sur la moelle épinière. Pour cela, on coupe la tête de l'animal en faisant tomber le coup des ciseaux au niveau de la moelle allongée, ou encore, on fait tout simplement la section, à l'aide d'un bistouri, au niveau d'une ligne passant par le bord postérieur des membranes du tympan.

Ces opérations ont, cependant, l'inconvénient de produire des hémorragies graves et de laisser les centres médullaires dans un état plus ou moins profond de choc. Ce fut donc un grand progrès dû à Baglioni[3], l'emploi d'une méthode de section de la moelle par écrasement. Pour cela, Baglioni a créé un petit instrument, facile à construire et qui donne pleine satisfaction (fig. 1). C'est une pince dont les branches sont parallèles et coudées, à l'extrémité, à angle droit. La branche inférieure est introduite par la bouche de l'animal jusqu'au point où la branche supérieure vient se placer au niveau de l'articulation entre le crâne et la prémière vertèbre. On serre progressivement la pince en manoeuvrant une vis qui rapproche les deux branches. Celles-ci écra-

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1 — C. Heymans et de Sommer. — Journ. de Physiol. et de Pathol. Gén. 1912, XIV, 1138.

2 — Methoden zur Untersuchung des überlebenden Zentralnervensystem, in Handb. der biol. Arbeitsmethoden. Abt. V. Teil 5B, Heft 4, 427-462.

3 — S. Baglioni. — Contributo alla fisiologia sperimentale dei movimenti riflessi : specificità qualitativa degli stimoli e specifità qualitativa dei riflessi. Arch. di Fisiol. 1904, I, 575-585. — Zur Analyse der Reflexfunktion. Wiesbaden, 1907

sent entre elles la moelle sans détruire la peau. La forte compression fait par elle-même l'hémostasie et on évite ainsi l'hémorragie.

Quand on ne possède pas une pince de Baglioni, on peut employer une autre méthode de section par écrasement que l'un de nous a sommairement décrite[4]. Cette méthode a été adoptée par plusieurs des physiologistes français. Madame L. Mazoué en donne une description dans sa thèse de doctorat[5]:

> «...la section de la moelle pouvant se faire au niveau du trou occipital au moyen d'une aiguille lancéolée qui fait à l'animal une faible blessure, ou mieux par une ligature, selon le procédé suivant que nous a indiqué M. Miguel Ozorio de Almeida et qui évite toute hémorragie: au niveau de la face dorsal de l'articulation cranio-vertébrale, à droite de la ligne médiane, on introduit par transfixion dans le pharynx un fil résistant qui, après avoir formé une anse, ressort en sens inverse à gauche de son point de pénétration; on lie alors en serrant fortement de manière à écraser la moelle».

Pour les Grenouilles de petite taille, et c'est généralement le cas des Grenouilles européennes, on peut encore employer tout simplement une pince d'Ombrédanne. C'est la technique adoptée par L. Lapicque et devenue courante dans son laboratoire.

Préparations de Baglioni et de Winterstein. — Baglioni a créé une technique d'isolement de la moelle, chez la Grenouille, largement employée dans plusieurs recherches[6] (fig. 2). Après avoir ouvert le canal vertébral de manière à exposer la moelle épinière, on isole complètement la colonne de toutes les parties environnantes. Le sciatique est disséqué jusqu'au genou, on sépare la jambe par une section faite à l'extremité postérieure de la cuisse. On enlève la peau qui recouvre la jambe, en conservant celle du pied. On a ainsi tout simplement une surface réceptrice d'excitations — la peau du pied — les muscles de la jambe, les nerfs sensitifs et moteurs compris dans le tronc du sciatique, et la moelle isolée. En Europe, la préparation de Baglioni peut conserver son excitabilité pendant plusieurs heures ou même plusieurs jours, suivant les conditions où elle se trouve. Si la moelle est environnée par une atmosphère d'oxygène pur, elle dure longtemps. Dans une atmosphère d'azote ou d'un gaz indifférent, l'excitabilité disparait au bout de deux ou trois quarts d'heure. On peut aussi plonger la moelle dans une solution physiologique saturée d'oxygène. La température a naturellement une grande influence sur la durée de la survie de la moelle. En somme, cette survie dépend des conditions de la respiration du tissu nerveux.

Winterstein[7] a modifié la préparation de Baglioni en libérant entièrement

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[4] — Miguel Ozorio de Almeida — Sur un réflexe tonique d'origine cutanée chez la Grenouille. C. R. de la Soc. de Biol., 1925, XCII, 688.

[5] — Madame Louis Mazoué. — Variations de l'excitabilité de la moelle épinière sous l'influence de certains agents physiques ou chimiques. Thèse de doctorat ès Sciences. Paris, 1930.

[6] — La fisiologia del midollo spinale isolato. Zeitschr. f. allg. Physiol. 1904, IV, 384-437.

[7] — H. Winterstein. — Zeitschr. f. allg. Physiol. 1907, VI, 315.

la moelle épinière elle-même de la colonne vertébrale. Cela exige évidemment des opérations plus longues et plus délicates. Mais Winterstein voulait surtout utiliser sa préparation dans des recherches sur les échanges gazeux de la moelle et il fallait, pour cela, la libérer le plus possible des tissus avoisinants.

Les préparations de Baglioni et de Winterstein ont servi, non seulement aux recherches sur le métabolisme des centres nerveux, comme encore à des travaux différents sur les courants électriques, sur l'action locale des toxiques (strychnine, phénol), etc. Elles sont encore particulièrement indiquées pour des recherches spéciales.

La préparation moelle épinière — train postérieur. — Les préparations que nous venons de décrire ont, cependant, pour certaines recherches, un inconvénient: elles réduisent trop le champ d'observation du système musculaire et ne permettent pas d'observer les actes réflexes dans toute leur complexité. Il fallait trouver le moyen d'obtenir des préparations que, tout en laissant la moelle isolée, permettent d'avoir des réactions plus complètes. C'est ce qu'il arrive avec la préparation créée il y a quelques années par l'un de nous [8]. Avant de la décrire signalons que son auteur n'avait pas alors connaissance d'une préparation essayée il y a déjà longtemps par Overton et dont nous venons de voir une description sommaire dans le travail d'ensemble de Winterstein. Comme il nous a été impossible de trouver le travail original d'Overton (Verh. d. Ges. d. Naturforscher u. Aerzte; 75. Vers. Cassel 1903, II. Teil. 2 Hälfte. 3, 416), nous reproduisons ici la citation de Winterstein:

> „Der erste, der zur Untersuchung des Ueberlebens der Nervenzentren eine Isolierung des Rückenmarkes durchführte, war Overton, der in Gemeinschaft mit v. Frey an abgekühlten Fröschen ein Präparat herstellte, bei dem das Rückenmark von hinten her in seiner ganzen Länge freigelegt und, in die Wirbelsäule eingelagert, herausgeschnitten wurde, so dass es nur durch die beiden Ischiadici mit den enthäuteten Hinterbeinen in Verbindung blieb. In mit Luft oder besser noch mit reinem Sauerstoff gesättigter Lösung von 0 bis 2° konnte die Reflexerregbarkeit eines derartigen Präparates (bei Austellung der Versuche im Herbst oder zu Anfang des Winters) mehrere Tage erhalten bleiben. Ganz analog ist das fast gleichzeitig und unabhängig von Overton von Baglioni hergestellte Präparat" [9].

La préparation moelle isolée — train postérieur est très facile à faire; un expérimentateur exercé ne dépense plus de deux à trois minutes pour faire l'opération et, sans doute, il faut plus de temps pour la décrire que pour l'obtenir. On coupe la moelle en la séparant de l'encéphale et l'on attache la Grenouille sur une plaque de liège. On coupe longitudinalement la peau du dos depuis l'anus jusqu'à la tête, en écartant latéralement les deux lambeaux. Après

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8 — Miguel Ozorio de Almeida. — Expériences sur l'exécution et la coordination des mouvements dans les réflexes cutanés de la Grenouille. C. R. de la Soc. de Biol. 1932, CIX, 452.

9 — H. Winterstein. l. c. pg. 141.

avoir de même coupé les grandes aponévroses dorsales, on soulève par une pince le sacrum, en coupant par des ciseaux les muscles sacro-coccygien et ilio-coccygien, qui recouvrent les nerfs lombaires. Ceux-ci sont rapidement disséqués et isolés. En introduisant de chaque côté l'une des branches des ciseaux entre l'os iliaque et la ligne latérale de la colonne vertébrale on fait des incisions parallèles à celle-ci, en dehors des apophyses transverses des vertèbres, jusqu'à atteindre la section supérieure qui a séparé la colonne du crâne. On finit l'isolement de la colonne vertébrale en coupant tous les organes ou tissus qui y sont attachés; on la rabat en arrière pour finir la préparation en isolant les os iliaques et en séparant le train postérieur de tous les organes voisins. La fig. 3 représente la préparation vue par sa face dorsale.

On peut conserver la moelle dans le canal vertébral intact, ou ouvrir celui-ci, quand on a besoin de faire des opérations sur la moelle ou de couper ou exciter les racines sensitives et motrices, ou encore faire l'application de différentes substances sur des points déterminés. Mais, dans plusieurs cas, il n'y a pas besoin d'opérer l'ouverture du canal qui doit, d'ailleurs, être pratiquée, quand il le faut, avant l'opération d'isolement de la moelle.

Si on laisse la moelle dans le canal vertébral intact, les échanges gazeux nécessaires ne se font pas dans de bonnes conditions et au bout d'un certain temps l'excitabilité disparaît. Ce temps dépend essentiellement des conditions de température. Dans notre laboratoire, où la température est presque toujours au-dessus de 20°, la moelle isolée conserve son excitabilité une demi-heure environ. On a ainsi le temps de faire bien des observations sur les réflexes. Ceux-ci se présentent avec tous les caractères normaux et l'un des avantages de cette forme de préparation c'est de pouvoir observer des phénomènes qui ne pourraient pas être étudiés dans la préparation si réduite de Baglioni et Winterstein. Ainsi si, en attachant un fil aux os iliaques l'on suspend la préparation à un support, de manière qu'elle tombe verticalement, on peut non seulement constater l'existence du tonus musculaire, comme encore provoquer tous les réflexes connus. Naturellement, la coordination des mouvements est conservée intacte, et, si l'on place un petit carré de papier imbibé d'une solution acide sur la cuisse de l'animal, on voit la patte se soulever et enlever la substance irritante, en la balayant avec l'extrémité des doigts.

Même si on n'ouvre pas le canal vertébral, la préparation peut conserver beaucoup plus longtemps son excitabilité si on la maintient dans une atmosphère d'oxygène pur, ou mieux encore d'oxygène sous pression, à deux atmosphères. Aussi, en maintenant les préparations à des températures basses, on peut avoir la réflectivité bien conservée pendant beaucoup plus longtemps.

La préparation moelle isolée — train postérieure s'est montrée un objet de choix pour de nombreuses recherches. En dehors des études sur la coordination des mouvements réflexes, nous l'avons employée dans toute une série de travaux sur la physiologie de la moelle. Ce n'est pas ici le lieu de les exposer et nous rappellerons seulement le phénomène tout-à-fait inattendu qui se montre quand on plonge la moelle isolée dans un bain de liquide de Ringer

à basse température (au-dessous de 6-7°); il se produit une attaque épileptiforme tonique et clonique d'une grande intensité[10].

L'étude détaillée de ce phénomène a déjà été l'objet d'une quinzaine de publications et les travaux se poursuivent activement dans notre laboratoire. Signalons cependant que l'attaque ne se produit pas, du moins dans ces conditions, chez les Grenouilles européennes[11]. Il constitue un phénomène absolument constant chez la Grenouille brésilienne (*Leptodactylus ocellatus*). Cette différence dans les réactions au froid entre deux espèces très voisines soulève des questions d'ordre général qui sont l'objet des recherches actuelles.

Nous avons souvent fait des préparations moelle isolée — train postérieur chez des animaux d'espèces différentes: des Crapauds, des Rainettes, etc.

Préparation moelle isolée — train postérieur, membres antérieurs. — (fig. 4). On peut conserver les membres antérieurs réliés à la colonne vertébrale et ayant leur innervation intacte. On a ainsi la possibilité d'élargir le champ d'observation des réactions. Nous employons maintenant cette préparation dans des travaux qui seront publiés incéssamment.

Préparations de moelle isolée chez les Lacertiliens. — Les petits Lezards peuvent donner des préparations de moelle isolée, en conservant les membres postérieurs ou les antérieurs, ou les quatre à la fois. La technique est facile à comprendre et la longueur de la colonne vertébrale permet de faire bon nombre d'expériences intéressantes. Par contre, chez ces animaux, on ne peut pas avoir le train postérieur complètement détaché et séparé de la colonne vertébrale comme chez la Grenouille. L'utilisation de ces préparations dépend donc du but que l'on a en vue.

Préparation de système nerveux intégral chez la Grenouille. — (fig. 5) et (fig. 6). On peut avoir une préparation dans laquelle tout le système nerveux central de la Grenouille est conservé[12] isolé des parties voisines. Pour obtenir cette préparation on opère comme dans le cas de la préparation moelle isolée — train postérieur, sans faire la section préalable de la moelle allongée. Quand on sépare la colonne vertébrale des parties latérales, en arrivant avec les ciseaux au squelette de la tête, on contourne celui-ci, en désarticulant ou coupant le maxillaire inférieur. L'opération étant faite des deux côtés, on la poursuit comme pour l'autre cas et on a alors tout le système nerveux central rélié au train postérieur par les nerfs lombaires. On peut préalablement ouvrir le canal vertébral ou le crâne s'il y a besoin.

Dans cette préparation, les réflexes cornéens, après une période de 2 ou 3 minutes de dépression, se montrent parfaitement conservés. Mais ce sont surtout les réflexes labyrinthiques produits par des changements brusques de position de la tête où par des mouvements de rotation qui se montrent dans des

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10 — Miguel Ozorio de Almeida. — Sur une attaque épileptiforme produite par le refroidissement brusque de la moelle de la Grenouille. C. R. de la Soc. de Biol. 1934, CXV, 78.

11 — Miguel Ozorio de Almeida. — Action du refroidissement brusque de la moelle isolée chez la Grenouille européenne. C. R. de la Soc. de Biol. 1937, CXXVI, 196.

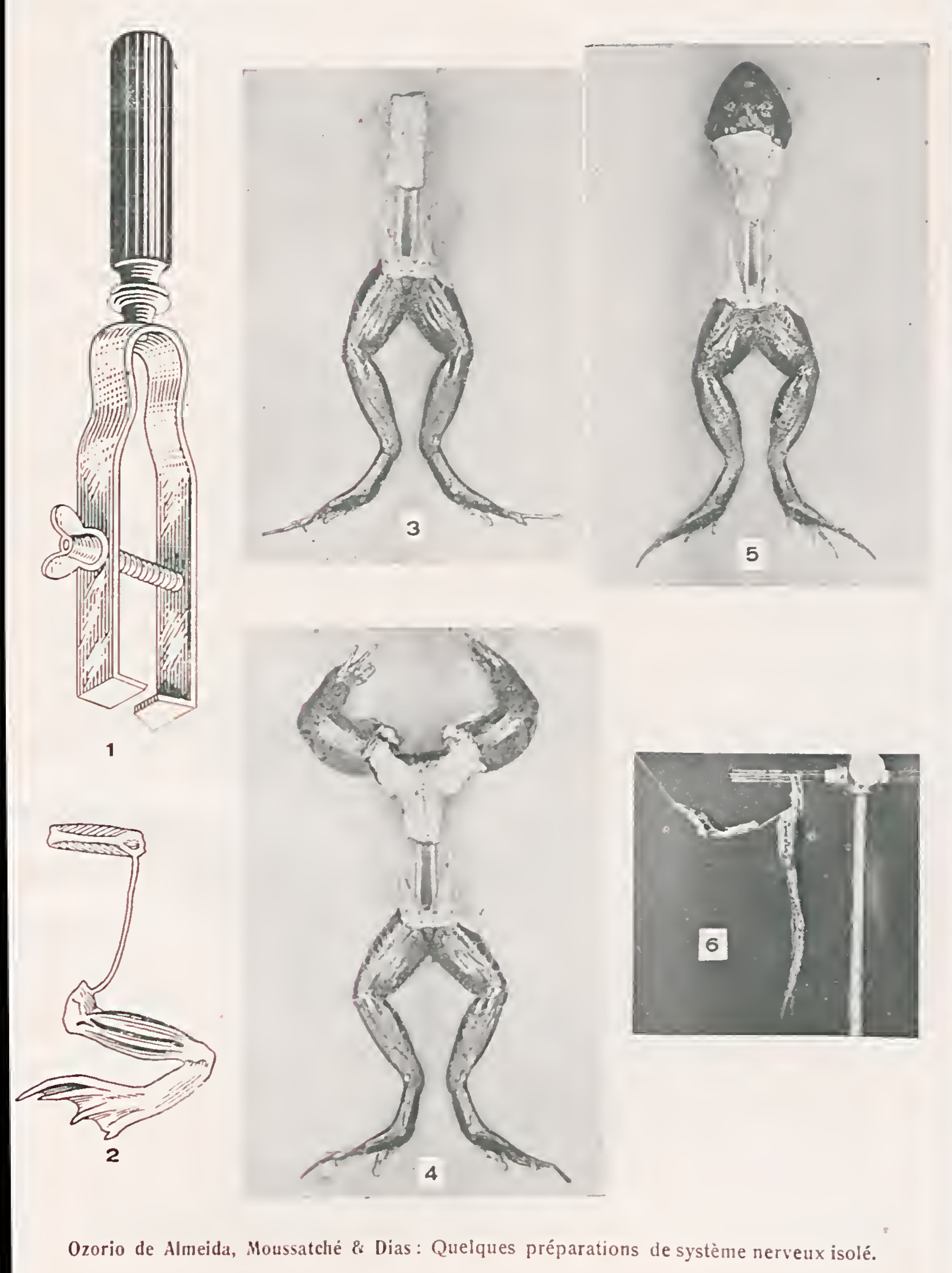
12 — Miguel Ozorio de Almeida. — Sur une préparation de système nerveux central isolé de Grenouille. C. R. de la Soc. de Biol. 1935, CXVIII, 716.

conditions très favorables pour l'étude. On peut donner toutes les positions que l'on veut à la tête solidaire avec la colonne vertébrale, sans toucher au train postérieur, puisque les nerfs lombaires se laissent courber ou ployer, sans aucun inconvénient. Les réactions réflexes de ce train postérieur se produisent alors et peuvent être observées beaucoup mieux que dans les conditions des techniques habituelles. En dehors de ce genre de travaux qui se poursuivent toujours, la préparation de système nerveux central a été utilisée dans les expériences sur l'attaque produite par le refroidissement.

Conclusions. — Nous avons décrit dans ce travail quelques préparations de système nerveux partiellement ou totalement isolé chez les Vertébrés inférieurs (Batraciens, Lacertiliens). Ces préparations, dont quelques'unes étaient encore inédites, nous offrent des possibilités très intéressantes dans l'étude de plusieurs phénomènes de physiologie du système nerveux.

Planche 1

Fig. 1 — Pince de Baglioni pour l'écrasement de la moelle épinière.
Fig. 2 — Préparation de moelle isolée d'après Baglioni.
Fig. 3 — Préparation moelle isolée — train postérieur de la Grenouille. Vue dorsale. Le canal vertébral a été conservé fermé.
Fig. 4 — Préparation moelle isolée — train postérieur et membres antérieurs. Ceux-ci conservent leur innervation. Grenouille mâle.
Fig. 5 — Préparation de système nerveux intégral isolé et rélié au train postérieur par les nerfs lombaires. Vue dorsale.
Fig. 6 — Préparation de système nerveux intégral vue de profil.



Ozorio de Almeida, Moussatché & Dias: Quelques préparations de système nerveux isolé.

cm 1 2 3 4 5 6 7 SciELO 11 12 13 14 15 16 17

Aspectos do Mycobacterium tuberculosis em cultura no leite

Genesio Pacheco
Instituto Oswaldo Cruz, Rio de Janeiro — Brasil

[Com 7 figuras no texto]

Ha poucas e exiguas referencias sobre a cultura de *Mycobacterium tuberculosis* no leite. Os tratados de bacteriologia referem apenas o crescimento, sem maiores detalhes; quando muito, falam de acidificação do leite tornasolado. Na pratica bacteriologica usa-se o leite de mistura com outras substancias nutritivas no meio de Petragnani, meio extremamente favoravel ao crescimento, utilisado ainda na differenciação dos typos de bacillos tuberculosos.

TECHNICA

MEIO. — *Leite fresco*, desnatado, foi distribuido em tubos de culturas, na quantidade de 12 cc. em cada tubo. Esterilisados os tubos em autoclave, a 115° durante 15 minutos, foram postos na estufa a 37° durante 24 horas e á temperatura ambiente por mais 24 horas, para verificação da esterilidade.

Leite tornasolado.— Uma série identica de tubos com leite foi addicionada de tintura de tornasol, a 5 %.

SEMEADURA. — A semeadura foi feita pela addição a cada tubo de 2 gottas de uma suspensão de germens preparada com um fragmento de cultura em batata glycerinada, de cerca de 2 mezes, agitada num tubo esteril contendo agua ligeiramente alcalinisada com hydroxydo de sódio e perolas de vidro, até obter suspensão apparentemente homogenea.

INCUBAÇÃO. — Após a semeadura eram as culturas incubadas a 37° e faziam-se com ellas esfregaços, após 15, 30 e 60 dias.

FONTES BACTERIANAS. — Usamos varias fontes de Mycobacterios:

N.° 71 — de origem *bovina*, amostra Vallée, do Instituto Pasteur de Paris, recebida por intermedio do Dr. Arlindo de Assis, em 1929.

N.° 283 — de origem *aviaria*, recebida em 1935, do Instituto Bacteriologico de Buenos Aires, por intermedio do Prof. Cezar Pinto.

N.° 145 — de origem *humana*, isolada por nós em 1924, de escarro tuberculoso.

N.° 190 — do typo *bovino*, isolada por nós em 1936, de ganglio dum caso de tuberculose do mesenterio, autopsia realisada pelo Dr. Magarinos Torres.

N.° 212 — do typo *bovino*, isolada por nós em 1935, de ganglio de caso identico ao precedente.

N.º 284 — de origem *bovina*, recebida em 1935 do Instituto Bacteriologico de Buenos Aires, por intermedio do Prof. Cezar Pinto.
N.º 282 — de origem *humana*, recebida do mesmo modo que a precedente.
N.º 146 — de origem *aviaria*, n.º 51 da N. C. T. C. do «Lister Institute», de Londres.
N.º 176 — de origem *humana*, isolada pelo Dr. Madureira Pará, em 1936, de escarro tuberculoso.

RESULTADOS. — Examinadas as culturas após 15 dias observamos crescimento dos Mycobacterios em alguns dos tubos semeados, conservando os germens sua acido-resistencia. Notamos, desde logo, certas particularidades no aspecto microscopico das culturas, não vistas ainda por nós nas culturas de Mycobacterios em meios liquidos.

Nos tubos em que houvera crescimento os germens appareciam como bastonetes isolados, corados pelo Ziehl. A maioria, porém, se reunia em agglomerados roseos ou vermelhos, apparentando dois aspectos distinctos a que denominamos «*fusos*» e «*globulos*». Os *fusos* eram formados por bacillos collocados lado a lado, no sentido do maior comprimento, formando grupos de 3 a 10 ou mais bastonetes, mais numerosos na parte central do fuso; os bacillos ficavam dispostos, ora mais approximados, ora mais afastados, mas sempre juntos. Os fusos eram alongados no sentido de um eixo longitudinal ou apresentavam um encurvamento no seu maior eixo, dando-lhes a apparencia de um crescente. Os *globulos* são inteiramente semelhantes ás formações denominadas globias, «globies», ou cellulas leprosas, «lepra bodies», do *Mycobacterium leprae*, e com estas confundiveis neste aspecto dispositivo. O numero de componentes destes globulos era muito variavel, de que resultava differenças muito grandes no tamanho dellas. O que os caracterisava, entretanto, era sua fórma regularmente arredondada, variando sempre as dimensões do agglomerado.

Após cerca de um mez de cultura houve proliferação em todos os tubos e o exame microscopico revelava predominancia franca dos globulos sobre os fusos, attingindo estes a numero incalculavel em algumas culturas, sendo menos numerosos noutras. Variavam tambem as dimensões, que attingiam a proporções enormes, numa ou noutra cultura.

A disposição dos bacillos nas formações globosas não era sempre egual a dos fusos. Arranjavam-se sem ordem, muitas vezes, ou formavam, afastando-se mais uns dos outros, uma especie de reticulo ou aspecto em mosaico, de linhas desordenadas na superficie. De ordinario accumulavam-se muito proximos uns dos outros, apparentando inteiramente grumos de bacterias agglutinadas. Não attentando bem podia-se tomal-os por precipitação de materia corante sobre a preparação. O leite propriamente não apparentava alteração, mesmo depois de 6 mezes de cultura: não coagulava, não se tornava viscoso, não se peptonisava. No leite tornasolado o tornasol não envermelhecia nem se reduzia a materia corante deste indicador. Em alguns tubos formava-se com o tempo uma camada amarellada na superficie, resultante do accumulo de germens, de mistura com a materia graxa do meio alli reunida.

No leite tornasolado o crescimento foi em geral mais pobre ou mesmo não se verificava.

A maior presença das formações globosas nas culturas no leite em detrimento dos fusos, e a existencia nestes de numero sempre menor de ba-

cillos que nos globulos, permitte pensar que sejam os fusos predecessores dos globulos, isto é, sejam « preglobulos ».

O aspecto dos globulos lembra exactamente a disposição demonstrada nas colonias bacterianas em meios solidos, pensando nós que se tratam de verdadeiras *colonias livres* de Mycobacterios.



Phases de formação das colonias: — 1. Bacillo isolado. 2. Inicio da formação = Dois bacillos reunidos. 3-4. Bacillos reunidos. 5-6. Agrupamento em *fuso*. 7. Agrupamento em mosaico ou *globulo* — colonia livre.

Formation of Colonies: — 1. Isolated Bacilli. 2. Beginning of « free colony » formation = Two Bacilli. 3-4. — Assembling of Bacilli. 5-6. — Assembling in *fuse*. 7. Colonies in mosaic or in *globule*.

Esta hypothese se nos afigura interessante, porque é uma demonstração da possibilidade de se organisarem colonias de bacterias tambem em meios liquidos, quando as condições são favoraveis a uma tal formação.

No caso em apreço não basta, parece, a natureza physico-chimica do leite, que representa uma composição chimica particularmente apropriada ao crescimento de grande numero de bacterias, especialmente de especies pathogenicas, de que resultou grande importancia deste alimento para a hygiene das doenças contagiosas; tambem a disposição physica de emulsão deve favorecel-a. Com effeito, a composição, e o estado emulsionado da gordura do leite por si só não explicam a faculdade de formação desses agglomerados ou colonias bacterianas, porque assim não crescem as bacterias ordinariamente cultivadas no leite simples ou tornasolado, incluindo-se aquellas peculiares a sua flóra bacteriana normal. Outro factor é preponderante na formação das colonias livres e reside na composição chimica dos *Mycobacterios*, cuja riqueza em cêras, acidos gordurosos e alcooes superiores os differenciam de outras especies bacterianas.

Desses componentes resultam propriedades physicas de insolubilidade e possibilidade de aggregação dos *Mycobacterios*, impedindo a dispersão dos elementos bacillares neoformados nas suas culturas no leite e a consequente formação de «colonias livres».

Esta particularidade do *Mycobacterium tuberculosis* explicaria tambem, a nosso vêr, certos caracteres da pathogenia deste germen, cuja tendencia á multiplicação local é conhecida, talvez resultante da propriedade ora evidenciada nas culturas em leite.

Origem identica deve-se attribuir ás globias do *M. leprae*, com a qual as formações ora encontradas no leite são inteiramente confundiveis microscopicamente.

RESUMO

A cultura do *Mycobacterium tuberculosis* no leite esteril, desnatado e esterilisado, revelou um crescimento interessante e não assignalado ainda nas culturas dessa bacteria. Após 15 a 30 dias os bacillos começam a se multiplicar, ficando a maioria reunida em agglomerados, em formações alongadas, adelgaçadas nas extremidades, a que o autor denominou «fusos», resultantes da reunião de 4 ou mais bacillos.

Com o tempo esses agglomerados augmentam, se arredondam pela multiplicação de innumeros bacillos, formando massas bacillares volumosas, de tamanhos variaveis, ou restando dispostas em reticulo, como as linhas da superficie de um mosaico. Chamou a estas formações «globulos». Pensa que estas formações representam verdadeiras «colonias bacterianas livres», cuja organisação é dependente da constituição chimica dos Mycobacterios e da natureza do meio de cultura empregado. Esse aspecto é analogo ao das «cellulas leprosas» (lepra bodies), e o autor acredita que a tendencia á multiplicação em fócos da tuberculose e da lepra, dependam dessa capacidade agglomeradora dos Mycobacterios. Os germens conservam bem a propriedade anti-descorante dos acidos dos methodos de coloração. O leite tornasolado não soffre alteração nem ha reducção do indicador.

ABSTRACT

The culture of *Mycobacterium tuberculosis* in sterile milk showed a peculiar growth not yet seen in cultures of that bacteria in liquid media. After 15 to 30 days the bacilli begin to multiply, the greater majority assembling in agglomerates, in enlarged formations, with tapering ends, called *fuses* by the author, and resulting from the assembling of 4 or more bacilli. These agglomerates soon acquired a rounded shape due to the multiplication of a great number of bacilli, forming bacterial bodies, variable in its size or standing like the lines on the surface of a net or mosaic. These formations are called «globules» by the author. He believes they represent true «free bacteria colonies» whose organisations is depending both from the chemical constitution of the Mycobacterium and the nature of the culture media.

These formations are analogous to the lepra bodies and the author believes that the tendency to foci multiplication of bacteria of *Mycobacterium* genera in organic tissues is due to such agglomerative capacity. The bacilli retain well their acid fastness, neither acidifying or alcalifying, nor reducing the lacmus-milk.

Metodi impiegati per lo studio dei cicli evolutivi dei Trematodi digenetici. Materiale per la conoscenza della biologia di Podocotyle atomon (Rud.).

Prof. Arturo Palombi
Stazione Zoologica di Napoli – Italia

[Con 5 figure nel testo]

E' noto che la biologia della maggior parte dei Trematodi digenetici (*Trematoidea* Baer) è ancora avvolta nel più fitto mistero. Richiamare l'attenzioni dei biologi su questo suggestivo argomento ed invogliare altri a dedicare la loro attività in questo campo di ricerca, ecco gli scopi di questo mio modesto contributo alle onoranze che estimatori, amici, assistenti e discepoli vollero rendere al Prof. Dr. Lauro Travassos il quale, nei 25 anni di instancabile e feconda attività di studioso e maestro, ha attratto, invogliato, formato ed indirizzato coll'esempio e con la parola, schiere di discepoli.



Il ciclo biologico dei distomi si svolge generalmente attraverso tre ospitatori: un mollusco (1.º ospitatore) nel quale penetra il *miracidio* che, raggiunto la massa viscerale (epatopancreas, organi genitali), si trasforma in *sporociste* o *redia* le quali, dopo altre generazioni di sporociste o redia danno in fine le *cercarie*; un crostaceo, un altro mollusco, un pesce ecc.... (2.º ospitatore, ospitatore intermedio) nei quali la cercaria penetra e si chiude in una capsula sia per continuare parte del suo sviluppo, sia per attendere, in questo stadio di *metacercaria* l'ulteriore sua evoluzione che avviene in un vertebrato che, predando l'ospitatore intermedio, ingerisce le metacercarie le quali attingono, in questo 3º ospitatore od ospitatore definitivo, lo stadio di *distoma* adulto e sessualmente maturo.

Talvolta manca l'ospitatore intermedio e la cercaria, come in *Schistosoma* penetra direttamente nell'ospitatore definitivo; talvolta la cercaria si incista sulle erbe in attesa che i vertebrati erbivori, compiendo il loro pasto, le ingeriscano; talvolta infine esiste un quarto ospitatore come ha mostrato Bosma (1931-1934) per *Alaria mustelae*, sebbene Joyeux & Baer pensino che questo possa essere un caso di reincapsulamento del parassita.

Le sedi dei distomi adulti sono le più varie: Stomaco, intestino, fegato, polmoni, vasi sanguigni e linfatici ecc. Qualunque sia la sede, purchè il parassita allo stadio larvale non penetri nell'ospitatore definitivo attraverso la pelle, occorre che esso giunga nella sua sede mediante l'ingestione delle metacercarie.

E di qui che occorre partire per un primo orientamento nelle ricerche. Scelto il distoma del quale si vuole conoscere la biologia, si procede all'esame attento e scrupoloso del materiale ingerito dall'ospitatore o dagli ospitatori del parassita; questa indagine permetterà, sopratutto se la ricerca è compiuta ra-

pidamente, su materiale fresco, prima che i succhi gastrico ed enterico abbiano potuto completamente attaccare il materiale ingerito, di osservare e raccogliere nello stomaco e nell'intestino i residui del pasto. Esaminando il materiale col binoculare, si potranno trovare, tra i residui non del tutto digeriti, le forme giovanili e talvolta anche le metacercarie del trematode albergato da quegli ospitatori scelti per lo studio.

Necessaria è la conoscenza della morfologia del parassita per poter ravvicinare le eventuali forme larvali che potranno trovarsi; tuttavia non sarà mai raccomandato abbastanza che la ricerca negli ospitatori definitivi non vada limitata a pochi individui soltanto, ma sia estesa al maggior numero possibile di esemplari in maniera che essa possa servire sia a conoscere meglio il trematode adulto, sia le eventuali forme larvali che potranno trovarsi, sia ancora la fauna e la flora che costituiscono il pasto degli animali.

E' stato così che io ho potuto ricostruire vari cicli evolutivi di trematodi parassiti di pesci del golfo di Napoli; è stato in base alla conoscenza del pasto degli animali ospitatori, integrata dalle notizie attinte sulla loro biologia che mi è stato possibile collegare forme larvali cogli adulti ed istituire ricerche sperimentali al fine di realizzare in laboratorio il ciclo evolutivo di alcuni distomi.

La conoscenza della morfologia delle cercarie e degli adulti rende inestimabili servizi nella ricostruzione dei cicli evolutivi; e lo studioso di biologia, aiutato da chiare e precise diagnosi, dovrà ancora una volta riconoscere l'alto valore della sistematica.

A volte ho tratto vantaggio dal confronto compiuto fra le curve di frequenza delle probabili forme larvali ed adulte del trematode in questioni ricavate dall'esame eseguito durante tutto un anno nei presunti ospitatori raccolti sempre nella medesima località Questo mezzo però dà migliori risultati nei casi in cui la ricerca venga compiuta in ospitatori che vivono in ambienti ristretti (stagni, laghi), come infatti a me riuscì per lo studio del ciclo biologico di *Bacciger bacciger* (Rud.), del quale io potetti studiare i vari stadi di sviluppo su materiale rinvenuto in ospitatori provenienti dal lago Fusaro (Napoli). Si tenga tuttavia presente che è dal concorso dei vari metodi che le ricerche possono prendere un orientamento felice.

Noto il pasto degli ospitatori, identificati gli organismi rinvenuti tra i residui dello stomaco, conosciuta la biologia di questi e di quelli, individuale le forme larvali, si può iniziare la ricerca per la realizzazione sperimentale del' ciclo evolutivo del parassita che interessa.

Se invero è relativamente più agevole riuscire per le forme terrestri e di acqua dolce, non altrettanto può dirsi per i distomidi marini per i quali, dato l'ambiente vastissimo, i presunti ospitatori intermedi sono numerosissimi. Per via di prove ripetute, e scartando quegli animali i quali si dimostrano incapaci di infettare gli ospitatori definitivi, si viene gradualmente a circoscrivere il campo di ricerca.

Va qui osservato che occorre innanzi tutto essere sicuri della immunità degli ospitatori definitivi: che cioè questi non alberghino già nel loro corpo parassiti. Per i trematodi viventi nell'intestino dei pesci io ho potuto osservare che nel *Blennius gattorugine* Brün. nutrito con pezzi di sardine (*Cuplea pilchardus*) dopo 6 mesi non si trova più alcun parassita, del resto, per maggior cautela, ho ritenuto sempre opportuno tenere tutti i pesci per un tempo più

lungo in maniera da avere maggiori garanzie di immunità. Per gli ucelli, Miriam Rothschild (1936) ha provato a far schiudere uova di *Larus ridibundus* L. al fine di ottenere esemplari immuni da usare per le eventuali infezioni allo scopo di determinare il ciclo evolutivo dei trematodi.

Sicuri che l'ospitatore definitivo non alberghi parassìti, si procede all'infezione. Questa parte del ciclo evolutivo è relativamente semplice ad essere realizzata, qualora la cercaria, sprovvista di coda, si incisti nella stessa sporociste (confr. Palombi, 1930, per *Diphtcrostomum brusinae* Stossich); ma anche negli altri casi la maggiore difficoltà può essere ugualmente superata dalla tenacia del ricercatore, il quale, come ho detto innanzi, raggiungerà lo scopo se, dopo aver circoscritto il campo di ricerca, proverà e sperimenterà ripetutamente cogli animali che costituiscono la pastura degli ospitatori, e sopratutto se non si lascerà scoraggiare dai primi risultati eventualmente negativi. Ma solo alla prova sperimentale, e soltanto a questa più volte ripetuta, occorre affidarsi: ogni giudizio espresso altrimenti, sia pure il resultato della migliore e più ragionata speculazione, può portare a grandi disillusioni; in biologia giocano tanti fattori, spesso imponderabili, che sfuggono all'indagine speculativa.

Molto più complessa e difficile invece è la ricerca del mollusco primo ospitatore dal quale la cercaria fuoriesce e, libera nell'ambiente, nuota in cerca dell'ospitatore intermedio. La conoscenza dell'ambiente agevola indubbiamente l'indagine, le cognizioni sulla frequenza delle forme larvali concorrono nella ricerca, ma è sopratutto il confronto fra la morfologia delle forme giovanili o meglio delle metacercarie che possono ritrovarsi nell'ospitatore definitivo con quella delle cercarie rinvenute nei molluschi che ci permette di collegare i vari stadi di sviluppo del trematode. Malgrado però questa conoscenza, non sempre è possibile giungere a conclusioni definitive, poichè spesso, identificata la cercaria, ci accorgiamo che questa non rappresenta un'entità specifica ben definita, ma un gruppo, o meglio un ceppo di cercarie le quali, sepure non differenziabili ancora per caratteri morfologici palesi, tuttavia si evolvono in maniera differente.

La soluzione dell'intricata questione della specificità delle forme appartenenti a tali ceppi, spianerebbe, di certo, molto la conoscenza dei cicli evolutivi dei trematodi; ma insufficienti sono i mezzi che disponiamo per scindere questi gruppi nelle loro unità. Penso che le ricerche intese a conoscere il numero dei cromosomi delle cercarie potrebbe non solo differenziare queste fra loro, ma potrebbe altresi permettere di collegarle coi probabili adulti dei quali pero bisognerebbe anche conoscere il numero dei cromosomi. Ma in questo campo pochissimo ci è noto, ed io richiamo l'attenzione degli studiosi su questo argomento e lo addito quale buon campo di ricerche da sfruttare convenientemente. Il gruppo della *Cercaria setifera* (non Joh. Müller) Monticelli può costituire un convincente esempio.

Da *Cercaria setifera* vivente in *Nassa (Amyclina) corniculum* Olivi io ho ottenuto, sperimentalmente, (Palombi, 1937) in *Blennius gattorugine* Brün., *Lepocreadium album* Stossich, trematode che avevo già precedentemente ottenuto (Palombi, 1931) nel medesimo pesce infettandolo con metacercarie rinvenute in *Aplysia punctata* Cuv.

Dal medesimo gruppo di *Cercaria setifera* traggono ancora origine, per quello che risulta dai mei esperimenti (Palombi, 1929) sia *Helicometra fasciata* (Rud.), la cui metacercaria può rinvenirsi in *Leander serratus* (Penn.), *L. squilla*

(L.), *L. xiphias* (Risso) e *Spirontocaris* (=*Hyppolite*) *cranchii* (Leach.), che *Podocotyle atomon* (Rud.).

Della biologia di quest'ultimo distoma io già mi sono occupato precedentemente (Palombi, 1932, 1934), aggiungo ora altre notizie che possono contribuire a rischiarare il suo ciclo evolutivo.

L'esame morfologico di *Podocotyle atomon* (Rud.) è stato esaurientemente compiuto da Odhner, Nicoll e Lebour: ai lavori dei citati autori rimando. Odhner e Nicoll si occuparono pure della sinonimia di questa specie la quale risulta complessa e confusa sia per la frequenza di *Podocotyle atomon* in molti differenti ospitatori, sia per la variabilità [Odhner infatti (1901) riconobbe tre varietà che in seguito (1905) riguardò come vere specie] sia infine per la somiglianza con altre due specie del genere (*Podocotyle olssoni* Odhner e *P. reflexa* (Crep.) le quali furono spesso confuse con quella.

Ritengo perciò utile raccogliere le notizie e tracciare il quadro della sinonimia di questa comunissima specie così come è a me risultato dall'esame bibliografico il quale mi ha condotto altresì a scartare alcune specie riferite a *Podocotyle atomon* mentre mi ha dato l'opportunità di riferirne qualche altra a questa.

Podocotyle atomon (Rud.) Odhner, 1905.

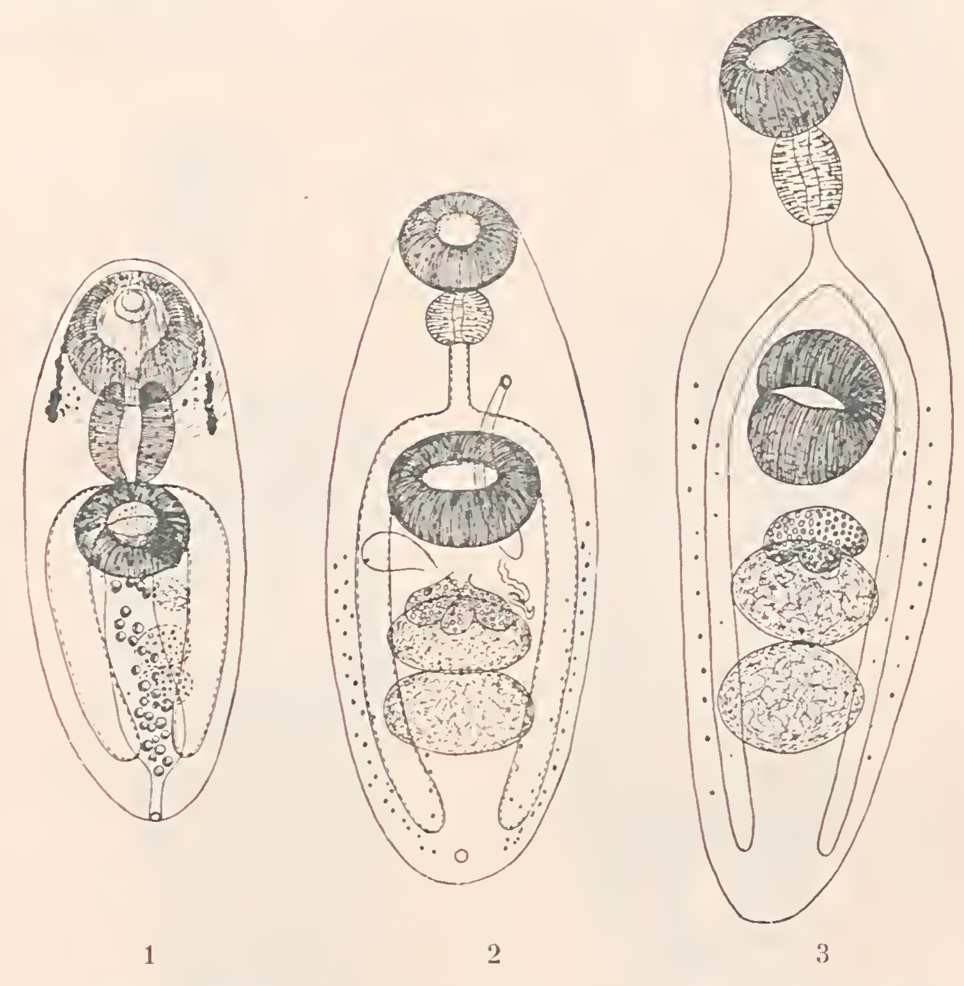
Fasciola Atomon Rudolphi 1802, p. 70.
Distoma Atomon Rud. 1809, vol. 2, p. 362.
Distoma angulatum Dujardin 1845, p. 401.
Allocreadium atomon (Rud.) Odhner 1901, p. 506, tav. 33, fgg. 9, 10.
Podocotyle atomon (Rud.) Odhner 1905, p. 320, tav. 2, fgg. 9, 10. Nicoll 1907, p. 73, tav. 1, fgg. 1, 2. Lebour 1907, p. 36, tav. 1, fig. 8. Stiles & Hassall 1908, p. 348. Nicoll 1913, p. 239; 1914, p. 473; 1915, pgg. 354-362. Manter 1926, p. 81, tav. 4, fig. 49. Palombi, 1932, p. 213; 1934, p. 90, fig. 34. Baylis & Idris Jones, 1933, p. 630. Linton, 1934. p. 126.
Psilostomum redactum Nicoll 1906, p. 525, tav. 13, fgg. 9, 10.
Podocotyle atherinae «spec. inq.» Nicoll 1914, p. 474, fig. 1.

Podocotyle atomon (Rud.) è una specie diffusissima. Nicoll (1915) riporta nella lista dei Trematodi parassiti dei pesci dei mari della Gran Bretagna, 31 specie di pesci, ospitatori di questo distoma. Anche ritenendo che la confusione con *P. olssoni* Odhner e *P. reflexa* (Crep.) possa aver accresciuto il numero dei pesci ospitatori, certamente è sempre ragguardevole il loro numero.

Io ho raccolto questa specie nell'intestino di *Atherina hepsetus* L. e *A. Boyeri* Risso tanto in esemplari provenienti dal golfo di Napoli che dal Fusaro. In questi pesci ho trovato che la maggiore frequenza del parassita ricorre nei mesi di marzo, aprile e maggio ed in tali mesi è del 23 %, mentre nei mesi estivi scende, ma di poco, al di sotto del 5 %. Fra le numerose forme adulte, ho avuto l'occasione di rinvenire alcuni esemplari giovanissimi e giovani dei quali dò qui i disegni.

Interessante è la corrispondenza delle forme giovanissime (Fig. 1) con *Cercaria setifera* (non Joh. Müller) Monticelli. Per quanto riguarda il confronto,

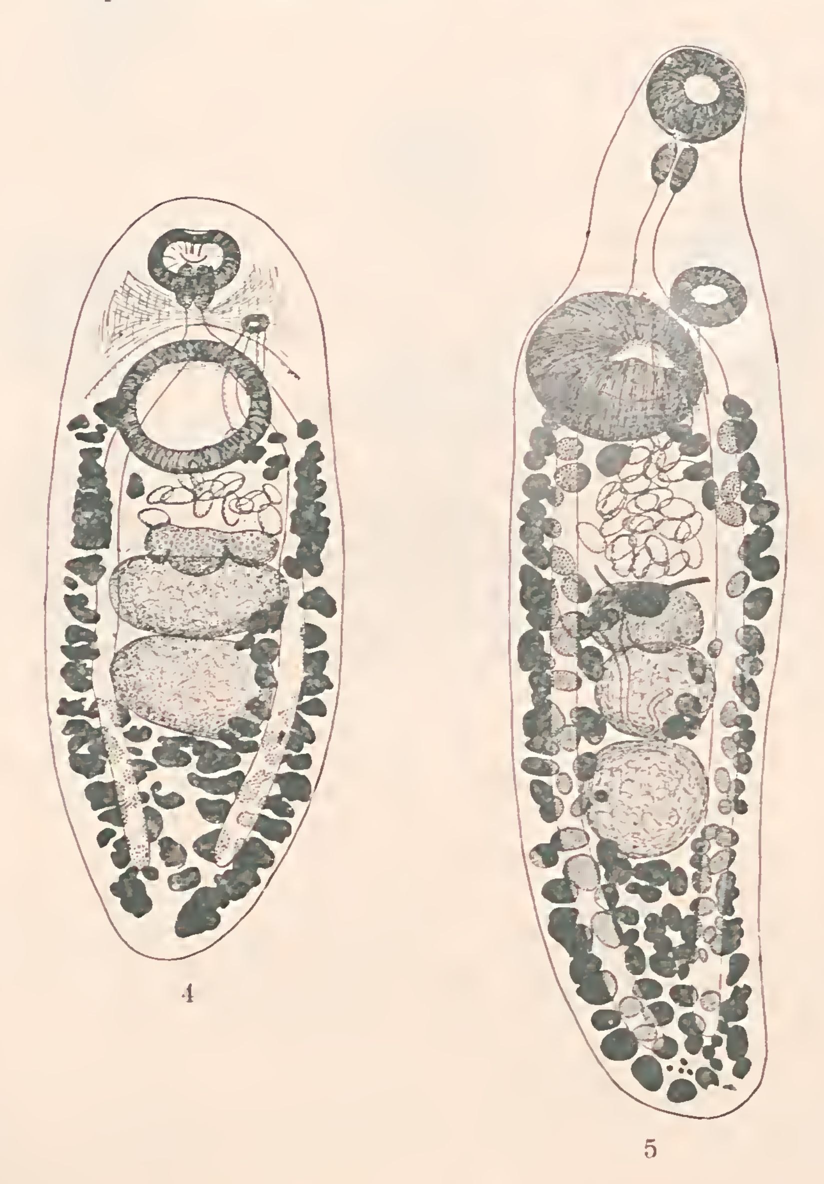
rimando a quanto ho già detto nel mio precedente lavoro del 1931, p. 90 che qui confermo.



Podocotyle atomon (Rud.) × 107. — Fig. 1. Metacercaria di *Cercaria setifera* (non Joh. Müller) Monticelli appena fuoriuscita dalla cisti raccolta nell'intestino di *Atherina hepsetus* L. — Figs. 2 e 3. Giovanissimi distomi raccolti rispettivamente nell'intestino di *Atherina hepsetus* L. e *A. Boyeri* Risso.

La forme successive dello sviluppo (fgg. 2 e 3), giovani distomi anche questi, già presentano differenziati alcuni organi tanto che già è possibile intravedere il loro ulteriore assetto e collegarli alla forma adulta. In questi successivi stadi si osservano non solo la scomparsa completa delle macchie oculari, ma si nota ben chiaro sia lo sviluppo che la differenzazione degli organi sessuali. La contrazione della parte anteriore del corpo e l'invaginazione della ventosa generalmente scompaiono, ma possono in qualche caso persistere.

La forma giovanile rappresentata nella Fig. 2 mostra qualche somiglianza con *Podocotyle atherinae*, una specie che il Nicoll, in base ad un esemplare raccolto nell'intestino di *Atherina presbyter*, ritenne come specie non del tutto sicura, anzi nelle considerazioni, avanzò il dubbio che potesse trattarsi di un anormale esemplare di *Podocotyle atomon*.



Figs. 4 e 5. – *Podocotyle atomon* (Rud.). × 80. Adulti. Notisi l'estremità anteriore dell'esemplare della fig. 4 invaginata e contratta.

L'esame di molti esemplari di *Podocotyle atomon*, e l'habitat affine, mi permettono di confermare il giudizio espresso dal Nicoll e di considerare sinonimo di questa specie, *Podocotyle atherinae* sp. inq. Nicoll 1914.

Del ciclo biologico di *Podocotyle atomon* (Rud.) ignoriamo ancora molto.

In base alle mie conoscenze acquistate in vari anni di lavoro, è quasi certo che esso si svolge in un mollusco gasteropodo (1° ospitatore) nel quale si formano le redie che mettono in libertà le cercarie appartenenti al gruppo di *Cercaria setifera* (non Joh. Müller) Monticelli.

Queste, libere nel pelago, nuotano finchè penetrano nell'ospitatore intermedio (2° ospitatore) che può essere, come accade per *Lepocreadium album* Stoss. che trae origine da una cercaria appartenente al medesimo ceppo, un mollusco (opistobranchio, eteropodo) nel quale esse si trasformano in metacercaria. L'ospitatore intermedio potrebbe essere anche un crostaceo come ci informa Levinsen che rinvenne in un anfipodo: *Themisto libellula* Mandt metacercarie di *Distomum simplex* Rud.? Olsson una specie affine (*Podocotyle olssoni* Odhner) se non proprio identica a *Podocotyle atomon* (Rud.).

Certamente l'ospitatore o gli ospitatori intermedi devono essere comunissimi, considerato il gran numero di pesci che albergano il distoma. Questo ultimo può raggiungere lo stadio adulto allorchè l'ospitatore intermedio, infetta da metacercarie, viene predato dai pesci (3° ospitatore od ospitatore definitivo) nell'intestino dei quali si chiude il ciclo.

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Travnema travnema n. g. e n. sp. (Nematoda Oxyuridae), parasito de Curimatus elegans (Pisces: Characinidae) no nordeste brasileiro

Clemente Pereira
Instituto Biologico de S. Paulo * — Brasil

[Com 2 estampas]

Em Julho do anno passado, ao examinarmos material de *Curimatus elegans* Steindachner, vulgarmente conhecido por «piabussú» no nordeste do paiz, tivemos opportunidade de encontrar varios exemplares do pequeno peixe parasitados, mas sempre apenas com 1 a 3 helminthos por hospedeiro, do oxyurideo que constitúe objecto do presente trabalho.

O material nos foi remettido pelos Drs. Pedro de Azevedo e Mario Vianna Dias, da «Commissão Technica de Piscicultura do Nordoeste», a quem agradecemos o excellente material.

Dedicamos este genero e especie ao infatigavel trabalhador prof. L. Travassos.

Travnema n. gen.

Oxyurinae: — Bocca circular, sem labios ou papillas; cavidade buccal relativamente larga e pouco profunda; pharynge grandemente desenvolvido, com forte musculatura radial; esophago curto e delicado, com bulbo posterior sem apparelho valvular typico.

Macho: — Azas lateraes delgadas ao longo de quasi todo o comprimento do corpo; ausencia de formações cuticulares cephalicas; cauda conica, simples; um espiculo unico; sem gubernaculo.

Femea: — Azas cervicaes bem desenvolvidas, azas lateraes reduzidas, até proximo da extremidade posterior; ausencia de formações cuticulares cephalicas; cauda conica; vulva pouco atraz do meio do corpo; ovejector curto. Ovos larvados, asymetricos, providos de operculo. Parasitos de peixes.

ESPECIE TYPO: — *Travnema travnema* n. sp.

Este genero approxima-se de *Oxyuris* Rud., 1803 pela forma dos ovos, distinguindo-se delle entretanto pelo conjuncto da organização; é muito typica a simplicidade de organização da cauda do macho.

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* Trabalho em collaboração do Instituto Biologico de São Paulo e da Commissão Technica de Piscicultura do Nordeste.

Travnema travnema n. sp.

Helminthos de côr branca, pequenos.

Machos (1 exemplar unico): — Comprimento, 1,1 mm.; espessura, approximadamente 0,1 mm. Cuticula com estriação bem accentuada.

Extremidade anterior com bocca circular, apparentemente sem labios nem papillas, dando entrada a capsula buccal relativamente ampla, provida de paredes chitinosas, medindo cerca de 0,012 mm. de diametro por 0,006 mm. de profundidade; pharynge fortemente musculoso, simulando um bulbo anterior, medindo 0,078 mm. de comprimento e cerca de 0,011 mm. de diametro; immediatamente em seguida vem o esophago propriamente dito, curto, apresentando um bulbo posterior fracamente muscularisado e sem um apparelho valvular perfeitamente individualisado; o esophago mede 0,086 mm. de comprimento total, apresentando na parte estreitada um diametro de 0,016 mm. e ao nivel do bulbo posterior, 0,045 mm. Annel nervoso a 0,086 mm. da extremidade anterior. Poro excretor amplo, situado a 0,35 mm. da extremidade anterior. Azas lateraes estreitas iniciando-se pouco atraz do inicio do pharynge, nivel onde apresentam um par de delicadissimas papillas.

Intestino simples. Apparelho genital constituido por um testiculo iniciando-se posteriormente, dirigindo-se para deante até as proximidades do póro excretor, do qual dista cerca de 0,06 mm., continúa-se com o canal deferente que se dirige para traz; ao nivel do inicio do testiculo se transforma no canal ejaculador, que vae ter á cloaca; espermatozoides com nucleo alongado.

Extremidade posterior afilada, terminando as azas lateraes ao nivel da cloaca; ausencia de azas caudaes; abertura da cloaca situada sobre uma eminencia mamelonada, medindo cerca de 0,020 mm. de altura por igual diametro na base e apresentando uma papilla mediana immediatamente posterior á cloaca; cauda com 0,12 mm. de comprimento; um unico espiculo medindo 0,015 mm de comprimento; ausencia de gubernaculo.

Femeas: — Comprimento, cerca de 2,1 a 3,13 mm.; espessura, approximadamente de 0,21 a 0,30 mm. Cuticula com estriação bem accentuada.

Extremidade anterior analoga á dos machos; capsula buccal medindo de 0,020 a 0,021 mm. de diametro por 0,012 a 0,016 mm. de profundidade; pharynge medindo 0,1 mm. de comprimento e cerca de 0,05 mm. de diametro; esophago medindo de 0,10 a 0,12 mm. de comprimento total, por 0,03 mm. de diametro na porção estreita e de 0,06 a 0,08 mm. no bulbo posterior. Annel nervoso pouco acima do bulbo posterior (a 0,11 mm. da extremidade anterior). Póro excretor situado de 0,6 a 0,76 mm. da extremidade anterior. Azas cephalicas bem desenvolvidas, ao nivel do esophago, seguidas de azas lateraes delgadas.

Intestino simples. Apparelho genital didelpho, opisthodelpho; ovarios iniciando-se ao nivel do anus, dirigindo-se para deante, oviductos ligeiramente sinuosos, attingindo as proximidades do esophago onde reflectem, apresentando espermathecas pouco differenciadas morphologicamente, ás quaes seguem-se os ramos uterinos, que se dirigem posteriormente até o nivel do anus, onde se lançam num tronco ovariano unico, que se dirige para deante, até o nivel da vulva, onde se lança no ovejector, cujo comprimento é approximadamente igual ao diametro do corpo da femea; vulva pouco atraz da metade do corpo (de 0,91 a 1,35 mm. da extremidade posterior). Anus a cerca de 0,16 mm. da extremidade posterior.

Ovos asymetricos, com casca lisa de duplo contorno, apresentando um operculo em uma das extremidades e um ligeiro adelgaçamento na extremidade opposta; medem de 0,164 a 0,169 mm. de maior diametro por 0,071 a 0,082 mm. de diametro transversal. No momento da postura já são larvados, apresentando a larva uma capsula buccal muito ampla, pharynge e esophago do mesmo typo que o dos adultos e as seguintes medidas: comprimento, 0,36 mm.; espessura, 0,028 mm.; pharynge, 0,019 mm. de comprimento; esophago, 0,045 mm. de comprimento; póro excretor a 0,079 mm. da extremidade anterior; cauda, 0,070 mm. de comprimento.

HOSPEDEIRO: — *Curimatus elegans* Steindachner.
HABITAT: — Intestino.
LOCALIDADE: — Lagôas de Tauape, Soure e Porangaba, Fortaleza (Ceará, Brasil).

Estampa 1

Travnema travnema n. sp.

Fig. 1 — Macho, vista total.
Fig. 2 — Femea, vista total.



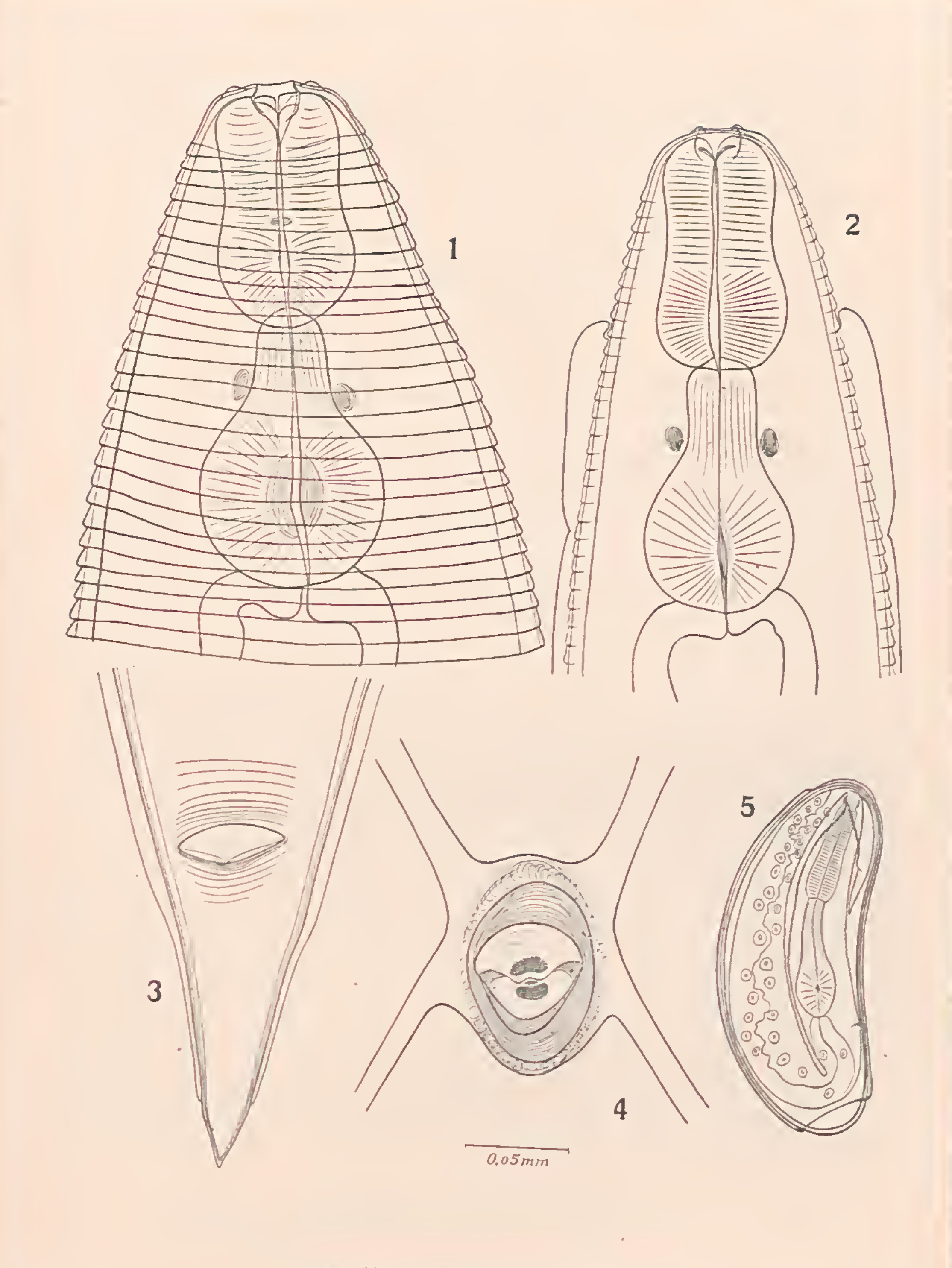
Pereira: *Travnema travnema*. n. g. e n. sp.

Estampa 2

Travnema travnema n. sp.

Fig. 1 — Extremidade anterior da femea, vista de perfil.
Fig. 2 — Extremidade anterior da femea, vista de frente.
Fig. 3 — Cauda da femea, vista de frente.
Fig. 4 — Póro excretor da femea, visto de frente.
Fig. 5 — Ovo larvado.

(Todas as figuras na mesma escala).



Pereira: *Travnema travnema.* n. g. e n. sp.

Contribuição para o conhecimento das Mallophagas das aves do Brasil

VII. Sobre uma nova especie do genero Neophilopterus

S. B. Pessôa e L. R. Guimarães
Departamento de Parasitologia da Faculdade de Medicina da Universidade de São Paulo — Brasil

[Com 1 estampa]

Neophilopterus travassosi n. sp.

Femea: — Cabeça pouco mais larga que longa ao nivel das temporas. Bordas lateraes da região anterior levemente concavas e apresentando duas cerdas ao nivel da signatura. A signatura clypeal é pouco chitinisada, apresenta sua borda anterior escavada, e de cada lado da borda posterior uma expansão bastante chitinisada terminando em ponta. Porção anterior do clypeo hyalina e com a borda quasi recta. Faixa temporal pouco chitinisada. Olho saliente e arredondado, com uma pequena cerda. Faixas occipitaes bem chitinisadas, divergindo-se até o nivel das antennas, onde se curvam em direcção á expansão chitinisada da signatura. Na face ventral esta faixa tem a forma de um funil cuja parte mais larga se acha ao nivel das mandibulas. *1.º* segmento antennal mais forte que os restantes; *2.º* segmento o mais longo, *3.º*, *4.º* e *5.º* subeguaes.

Trabeculas grandes e triangulares. Temporas de bordas arredondadas e apresentando quatro cerdas de tamanho médio e duas menores, além de outra pequena mais internamente. Duas cerdas sobre as faixas antennaes, ventralmente. Sobre a signatura duas cerdas pequenas na face dorsal e outra na face ventral.

Prothorax sub-quadrangular, mais largo que longo, e apresentando transversalmente uma larga faixa chitinisada, que toma quasi todo o seu comprimento, e é separada ao meio apenas por um pequeno espaço claro; duas cerdas, de tamanhos desiguaes no seu angulo latero-posterior. Pterothorax mais largo que o prothorax; apresenta uma faixa semelhante á do prothorax, mas com as bordas internas mais arredondadas e mais chitinisadas. Bordas lateraes arredondadas, apresentando um espinho e uma cerda nos angulos latero-posteriores, e mais internamente tres cerdas cujas bases são muito juntas e nascem de um espaço rectangular incolor. Entre o 1.º e 2.º par de patas ha uma trave bastante chitinisada que se alarga muito na sua extremidade interna; entre o 2.º e 3.º par ha uma trave semelhante, mas mais delicada e bifurcada; e posteriormente ao 3.º par esta trave é menos chitinisada e se alarga gradativamente em direcção á sua extremidade interna. Logo abaixo da primeira trave ha uma cerda e sobre o ramo anterior da segunda trave duas outras menores.

Trabalho lido na Soc. de Biologia de São Paulo em sessão de 9-8-937.

Abdomen ovalado, tendo sua maior largura ao nivel do 4.º segmento. Placas tergaes do 2.º ao 7.º segmentos muito pouco chitinisadas e largamente separadas na linha mediana; faixas pleuraes mais escuras e sem limites nitidos, estigmas bem visiveis e situados em espaços arredondados e menos chitinisados. As placas tergaes do 1.º segmento abdominal são separadas apenas por uma estreita faixa mediana incolor e apresentam duas expansões angulares nas suas extremidades internas; uma anterior e outra posterior; a sua borda anterior apresenta outra expansão angular perto de sua linha mediana. Placas tergaes do 8.º segmento unidas na linha mediana e com o angulo latero-posterior em ponta aguda. Ventralmente as placas pleuraes são bem delimitadas e no 2.º e 3.º segmentos ellas apresentam uma ponta voltada posteriormente.

Tres a quatro cerdas nos angulos latero-posteriores de todos os segmentos. Na face dorsal dos segmentos 1.º a 7.º apresentam-se duas fileiras de cerdas, sendo a anterior sempre menos numerosa que a posterior. A fileira anterior do 1.º e 7.º segmentos é formada apenas de duas cerdas. Na face ventral ha apenas uma fileira sobre os seis primeiros segmentos.

Segmento apical com a borda posterior quasi recta e chanfrada na linha mediana. Dois prolongamentos digitiformes que nascem junto ao angulo latero-anterior deste segmento e apresentam 3 a 4 pequenos pêlos na sua extremidade distal; uma fileira de finas cerdas acompanha, quasi parallelamente, as bordas lateraes do mesmo segmento apical. Placa genital trapezoidal tomando todo comprimento do 7.º segmento, separada ao meio por um espaço incolor e tendo suas bordas externas mais chitinisadas. Logo abaixo desta placa encontram-se duas fileiras irregulares de minusculos espinhos.

Macho. — Differencia-se da *femea* por apresentar cinco minusculos espinhos junto a borda interna da faixa occipital; por apresentar os desenhos do 1.º segmento abdominal mais nitidos e as placas tergaes e as faixas lateraes do abdomen muito mais chitinisadas. Seu abdomen é mais arredondado e a placa genital integra. Apparelho copulador forte; placa basal uma vez e meia o comprimento dos parameros e apresentando duas faixas mais chitinisadas internamente; parameros robustos, com a extremidade distal levemente voltada para dentro, endomeros separados apenas na região distal por uma chanfradura em angulo agudo com o vertice voltado anteriormente; penis conico, apresentando uma faixa em suas bordas externas.

MENSURAÇÕES EM MM.

	Comprimento		*Largura*	
	Femea	Macho	Femea	Macho
Cabeça	0,840	0,742	0,910	0,820
Prothorax	0,238	0,196	0,602	0,560
Pterothorax	0,245	0,210	0,756	0,686
Abdomen	1,590	1,120	1,288	1,008
Total	2,940	2,296	—	—

Holotypo femea e allotypo macho conservados na collecção de insectos do Laboratorio de Parasitologia da Faculdade de Medicina de São Paulo e re-

tirados, no Museu Paulista, de uma pelle de *Tantalus americanus*, Rio S. Francisco, Minas, Garbe coll., 1913.

Paratypo um macho tambem retirado de uma pelle de *Tantalus americanus,* proveniente de São Paulo.

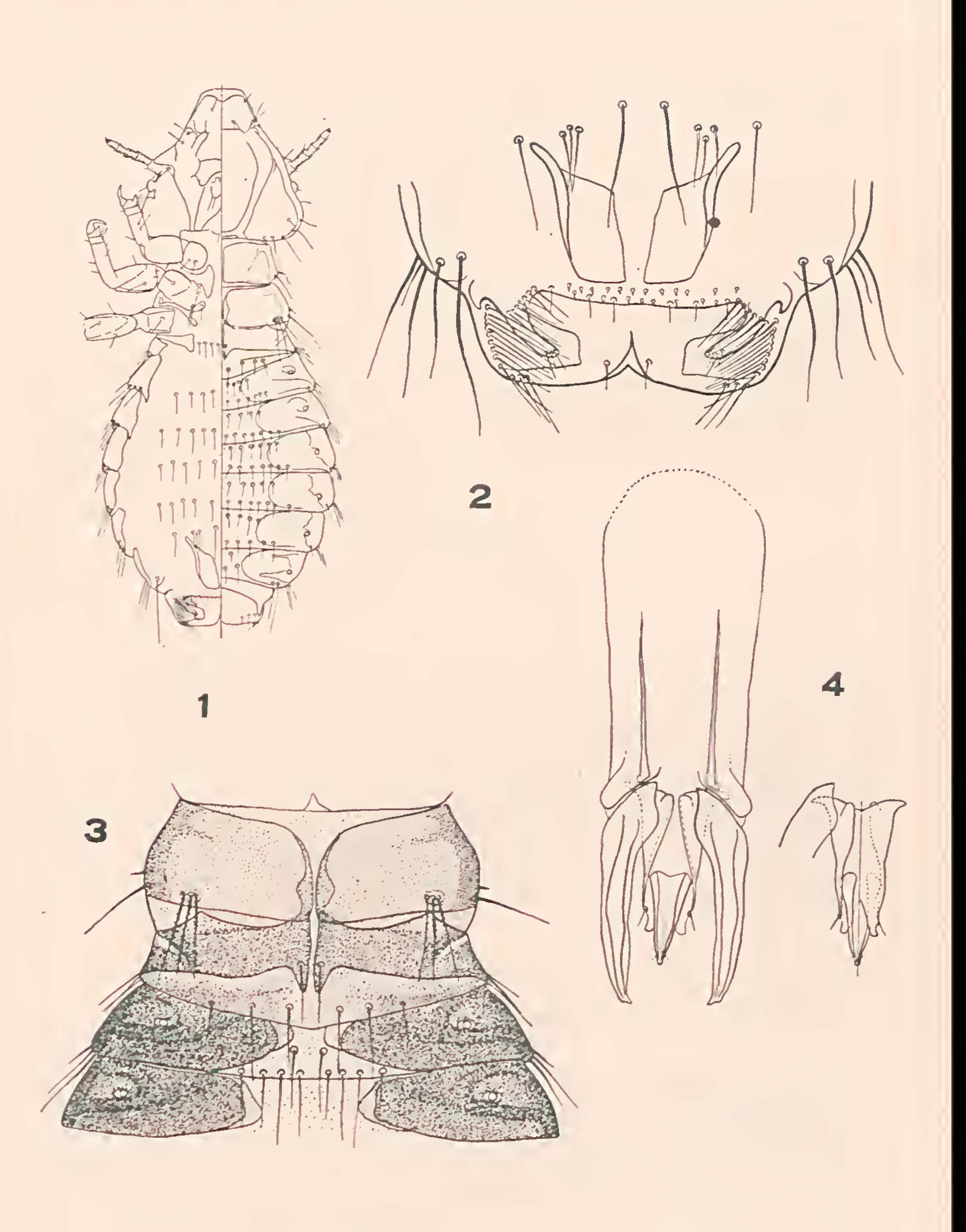
Dedicamos esta especie ao Prof. Dr. Lauro Travassos, illustre chefe do Laboratorio do Instituto Oswaldo Cruz e antigo professor de Parasitologia da Faculdade de Medicina de São Paulo.

Esta especie é bastante affim a *N. abdninus* Bedford e *N. unifasciatus* (Piaget). De *N. abdninus* nossa especie se differencia pelos orgãos genitaes do macho, placa genital e placa tergal do segmento apical da femea, e pela forma da placa tergal do 1.º segmento abdominal. De *N. unifasciatus* se differencia pelo formato de cabeça, pterothorax e 1.º segmento abdominal.

Estampa 1

Neophilopterus travassosi n. sp.

Fig. 1 — Femea.
Fig. 2 — Extremidade apical da femea.
Fig. 3 — Pterothorax, 1.º, 2.º e 3.º segmentos abdominaes do macho (face dorsal).
Fig. 4 — Apparelho copulador do macho.



Pessôa & Guimarães: Nova especie de *Neophilopterus*.

Eine neue Trematode aus Fam. Steringophoridae

Dr. S. W. Pigulewsky
Zoologisches Museum der Russischen Akademie der Wissenschaften. Leningrad — U. R. S. S.

[Mit 1 Fig. im Text]

Bei der Untersuchung der „Chamsa" (*Engraulus encrasicholus ponticus* Pus.) des Schwarzen Meeres am Ufer der Krim in Bezieheus der Ansteckung durch Würmer, entdeckte ich eine neue Trematode, welche allen Kennzeichen nach überhaupt diesen geeignet überhaupt Fam. *Steringophoridae* passte aber gar nicht zu einer der bekannten Gattung dieser Familie, infolgedessen musste man sie in eine selbständige Gattung.

Fam. **STERINGOPHORIDAE** Odhner, 1911.

Unterfam. *STERINGOPHORINAE* Odhner, 1911.

Gatt. **Ovotrema** nov. gen.

Parasiten länglich-ovaler Form, mit glatter Cuticula. Bauchsaugnapf mehr als anderthalbmal so gross als der Mundsaugnapf; er liegt ungefähr am Anfang des zweiten Körperdrittels. Pharynx ist rund. Die Zweige des Darmkanals sind einfach. Das hintere Ende des Parasiten erreichen sie nicht. Genitalporus unweit der Höhe der Darmgabelung, stark linksseitig verschoben. Cirrusbeutel von ovaler Form. Ovale Hoden sind an den Rändern des Parasitenkörpers. Dotterstöcke symmetrisch; hinter dem Mundsaugnapf. Keimstock kugelförmig oder oval hinter den Hoden. Uterus nimmt die ganze hintere Körperhälfte des Parasiten ein.

Ovotrema pontica nov. spec.

Wurde im Darmkanal eines „Chamsa" (*Engraulus encrasicholus ponticus* Pusan.) im Schwarzen Meer gefunden.

Parasit von länglich-ovaler Form, mit flachem Körper, glatter und dünner Cuticula, 0,93-1,08 mm. lang und 0,39-0,48 mm. breit. Der Mundsaugnapf ist 0,072-0,087 mm. im Durchmesser. Der Bauchsaugnapf ist rund und grösser wie der Mundsaugnapf — 0,174 mm. im Diameter. Pharynx hat 0,043 mm. im Diameter. Traubenförmige Dotterstöcke, die in der vorderen Körperhälfte liegen, betragen 0,007 × 0,022 mm. Keimstock von ovaler Form, beträgt 0,087 × 0,127

mm: Der Uterus mit einer grossen Zahl von Litzen liegt in der hinteren Hälfte des Parasiten. Die Eier sind klein, oval, haben eine glatte Hülle mit doppelten Konturen, hellgelb, 0,020 × 0,029 mm. Die ovalen Hoden haben eine regelmässige Form, liegen hinter dem Bauchsaugnapf, und sind gleich gross

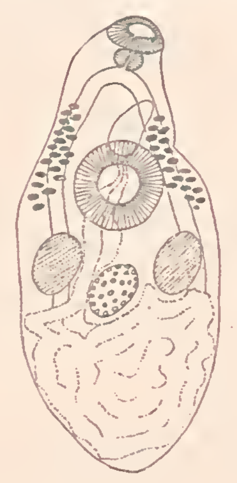


Fig. 1 — *Ovotrema pontica* nov. spec.

0,101 — 0,104 × 0,130 — 0,135 mm. Bursa cirri ergreift mit ihrem unteren Rande den Bauchsaugnapf und öffnet sich mit der Geschlechtsöffnung seitlich auf der Höhe der Darmkanalbifurkation.

Zur Revision der Parasiten-Gattung Lecithaster Lühe, 1901 *

Dr. S. W. Pigulewsky

Zoologisches Museum der Russischen Akademie der Wissenschaften, Leningrad — U. R. S. S.

[Mit 1 Fig. im Text]

Im Jahre 1802 hat Rudolphi eine neue Trematode — *Fasciola gibbosa* beschrieben, welche Lühe (1901) in eine besondere Gattung *Lecithaster* ausgeteilt hat; mehrere Jahre später hat Odhner (1905) diese zu einer schon bekannten Aussehen dieser Gattung, noch einen Parasit — *Lecit. confusus* hinzugefügt und schied diese Gattung in eine besondere Unterfamilie aus — *Lecithasterinae,* zu welcher Looss (1907) noch eine Gattung — *Aponurus* und zwei neue Arten — *Lecithaster* hinzufügte.

Zur Zeit ist der systematische Zustand der Parasiten in dem *Hemiuridae,* wohin alle Parasiten dieser Gattung *Lecithaster* Lühe (1901) hinzugezählt hat, können in folgender Art vorgestellt werden.

Fam. *HEMIURIDAE*

Unterfam. *HEMIURINAE*	Unterfam. *DINURINAE*	Unterfam. *STERRHURINAE*	Unterfam. *SCLERODISTOMINAE*	Unterfam. *DEROGENETINAE*	Unterfam. *LECITHASTERINAE*
Gatt. *Hemiurus*	Gatt. *Dinurus*	Gatt. *Sterrhurus*	Gatt. *Sclerodistomum*	Gatt. *Derogenes*	Gatt. *Lecithaster*
" *Aphanurus*	" *Ectenurus*	" *Lecithochirium*	" *Eurycaelum*	" *Progonus*	" *Aponurus*
" *Brachiphallus*	" *Lecithocladium*	" *Pleururus*	" *Hirudinella*	" *Bunocotyle*	" *Mordwilkoviaster*
		" *Lecithurus*	" *Isoparorchis*	" *Gonocerca*	
				" *Lecithophyllum*	
				" *Genarchopsis*	

* Herrn Dr. Lauro Travassos meine Arbeit gewidmet.

Die Unterfamilie *Lecithasterinae*, welche in sich zwei Gatt. *Aponurus* und *Lecithaster* enthält, in letzteren 7 Arten.

1. *L. gibbosus* (Rud.), 1802.
2. *L. confusus* Odhner, 1905.
3. *L. stellatus* Looss, 1907.
4. *L. galeatus* Looss, 1907.
5. *L. anisotremi* Mc Callum, 1921.
6. *L. lindbergi* Layman, 1930.
7. *L. salmonis* Yamaguti, 1934.

Obgleich im Zusammenhang mit der Durchsicht der Parasiten der Gattung *Lecithaster* musste man ausscheiden *L. galeatus* und *L. anisotremi* in eine selbständige Gattung *Mordvilkoviaster* aussehen den und *L. lindbergi* ebenso in eine neue Gattung ausgeschieden musste man infolgedessen in eine neue Unterfamilie *Sterrhurinae* übertragen werden.

Endgültig wird quest. Unterfamilie in folgender Weise aussehen:

Unterfam. *LECITHASTERINAE*

Gatt. *Lecithaster*	Gatt. *Mordvilkoviaster*	Gatt. *Aponurus*
L. gibbosus	*M. galeatus*	*A. laguncula* (Typ.)
L. confusus	*M. anisotremi*	
L. stellatus		
L. salmonis		
L. tauricus		

A. Unterfam. **LECITHASTERINAE** Odhner, 1905.

Ca. 1-3 mm. lange, ziemlich drehrunde Distomiden, mit glatter, sehr dünner Cuticula Körperumriss von mehr oder weniger gedrungener Spindelform. Schwanzanhang fehlt. Bauchsaugnapf vor der Körpermitte. Verdauungs- und Exkretionsapparat wie bei den Hemiurinen. Genitalporus median vor der Mitte zwischen den Saugnäpfen. Sinus genitalis röhrenförmig, von einem Cirrusbeutel umschlossen und als Kopulationsorgan dienend. P. prostatica schlauchförmig, mehr oder weniger langgestreckt. Samenblase gross, dünnwandig, ungeteilt in der Nähe des Bauchsaugnapfs. Hoden kugelig, annähernd symmetrisch, dicht hinter dem Bauchsaugnapf. Hinter ihnen zuerst der Keimstock und dann der unpaare Dotterstock, der normalerweise aus 7 radiär angeordneten Schläuchen besteht. Receptaculum seminis vorhanden, sehr gross. Laurer'scher Kanal fehlt. Uteruswindungen fast den ganzen Körper ausfüllend (Odhner, 1905).

1. Gatt. *LECITHASTER* Lühe, 1901.

Sehr kleine Formen mit annähernd spindelförmigem Körper, ovalem Querschnitt, glatter, nicht geringelter Haut und sehr kleinem Schwanzanhang. Bauch-

saugnapf vor der Körpermitte. Cirrusbeutel vorhanden, umschliesst nur den Ductus hermaphroditus. Pars prostatica verhältnismässig lang, Samenblase dorsal vom Bauchsaugnapf. Hoden annähernd symmetrisch, ziemlich dicht hinter dem Bauchsaugnapf. Keimstock hinter dem Hoden, stark gelappt, hinter ihm der anscheinend unpaare Dotterstock, welcher aus annähernd radiär angeordneten Schläuchen besteht. Receptaculum seminis vorhanden, Laurer'scher Canal fehlt; Schenkel der Exkretionsblase dorsal vom Pharynx in einander übergehend. (Nach Lühe). Zu dieser Gattung gehören 5 Arten:

1. **Lecithaster gibbosus** (Rud.) 1802.

(Syn.: *Fasciola gibbosa*, Rud. 1802; *Dist. gibbosum* Rud. 1809, *nec Dist. Bergense* Olss., 1868; *Dist. mollissimum*, Lev. 1881, *nec Dist. mollissimum* Stoss. 1889, *nec Apoblema mollissimum* Lss. 1896).

Die Länge der Parasiten bis 1,75 mm., Maximalbreite 0,5 mm. Pars prostatica ist kurz, hinter dem Bauchsaugnapf. Keimstock vierlappig; Eier 0,025-0,027 mm. lang und 0,013 mm. breit. In *Gadus merlangus*, *Scomber scomber*, *Belone acus*, *Clupea harengus* und andere Fische des Nordmeeres.

2. **Lecithaster confusus** Odhn. 1905.

(Syn.: *Apoblema mollissimum* Lss. 1896, *nec Dist. mollissimum* Lev. 1881 = *Hemiurus bothryophorus* Lss. 1899, *nec Dist. bothryophoron* Olss. 1869).

Die Länge der Parasiten ist 1,0-1,5-2,0 mm.; Maximalbreite 0,3-0,5 mm. Mundsaugnapf 0,13-0,16 mm. im Durchmesser. Bauchsaugnapf 0,25-0,27 mm. im Diameter. Pars prostatica hinter dem Bauchsaugnapf. Pharynx 0,07-0,085 mm. im Durchmesser. Bursa cirri 0,08-0,11 mm. lang. Die Dotterstöcke haben 0,25 mm. im Durchmesser. Eier sind filamentlos, 0,015-0,017 mm. lang und 0,017 mm. breit. Im Darmkanal von *Alosa finta* (Nyl) und *Clupea harengus* (Nordmeer).

3. **Lecithaster stellatus** Looss, 1907.

Die Länge der Parasiten 1,0-1,3 mm. Maximalbreite 0,36 mm. Der Bauchsaugnapf ist rund, beträgt 0,08-0,1 bis 0,17-0,2 mm. Dotterstöcke handförmig zerspalten; Keimstock gelappt. Die Eier sind 0,015-0,017 mm. lang und 0,009-0,011 mm. breit. Wirt: *Belone acus*, *Maena vulgaris* und *Dentex vulgaris*.

4. **Lecithaster salmonis** Yamaguti, 1931.

Die Länge der Würmer beträgt 1,2 mm., ihre Breite 0,17 mm. Der Mundsaugnapf ist 0,071 mm. breit und 0,11 mm. lang. Pharynx 0,053 × 0,071 mm. Der Oesophagus ist kurz. Hoden sind rund, 0,1 mm. in Diameter. Vesicula seminalis 0,13 × 0,081 mm. Receptaculum seminis 0,12 × 0,11 mm. Uterus nimmt die ganze hintere Körperhälfte des Parasiten ein. Die Eier sind 0,0237 mm. lang und 0,0158 mm. breit. Wirt: *Salmo keta* (Japan).

5. **Lecithaster tauricus** nov. spec.

Wurde im Darmkanal eines „Chamsa" (*Engraulus encrasicholus ponticus* Pusan.) im Schwarzen Meer gefunden. Parasit von länglich ovaler Form, mit flachem Körper und glatter Cuticula, 1,50-1,74 mm. lang und 0,27-0,75 mm. breit. Der Mundsaugnapf ist rund, 0,116 mm. im Diameter; der Bauchsaugnapf ist auch rund, 0,217 mm. im Durchmesser. Pharynx hat 0,72-0,81 mm. im Durchmesser. Die Zweige des Darmkanals sind einfach, das hintere Ende des Parasiten erreichen sie nicht. Die exeretorische Blase liegt am hinteren Ende des Körpers. Keimstock und Dotterstöcke gelappt; ihre Lappen sind oval, 0,081-0,087 mm. breit und 0,110 mm. lang. Der Uterus mit einer grossen Zahl von Litzen liegt im vorderen Drittel des Parasiten und gelangt nicht ganz an das hintere Ende seines Körpers. Die Eier sind klein, oval, haben eine glatte Hülle mit doppelten Konturen, hellgelb, 0,011 mm. breit und 0,020 mm. lang. Die ovalen Hoden haben eine regelmässige Form und sind gleich gross, 0,130-0,174 × 0,197-0,232 mm. Pars prostatica wie die Hoden. Bursa cirri lang. Die Geschlechtsöffnungen liegen hinten von Pharynx.

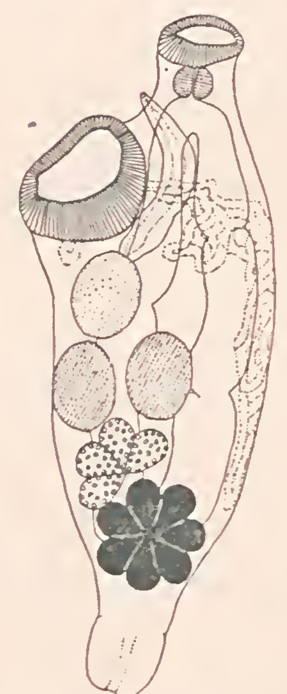


Fig. 1 — *Lecithaster tauricus* nov. spec.

II. Gatt. *MORDVILKOVIASTER* nov. gen.[1]

Parasiten länglich-ovaler Form, mit glatter Cuticula. Bauchsaugnapf mehr als anderthalbmal so gross als der Mundsaugnapf; er liegt ungefähr am An-

[1] Benannt zu Ehren des Dr. A. K. Mordvilko, Professor in Leningrad.

fang des zweiten Körperdrittels. Die Zweige des Darmkanals sind einfach, das hintere Ende des Parasiten erreichen sie nicht. Exkretionsblase liegt am hinteren Ende des Körpers. Hoden annähernd symmetrisch, ziemlich dicht hinter dem Bauchsaugnapf; Pars prostatica birnförmig. Keimstock kugelförmig oder oval. Dotterstöcke 7-lappig. Im Darmkanal von nordamerikanischen und nordafrikanischen Fischen.

Neue Gattung hat kugelförmige oder ovale (nicht gelappte!) Dotterstöcke, und enthält in letzteren 2 Arten:

1. **Mordvilkoviaster galeatus** (Lss., 1907).

Die Länge der Würmer beträgt 0,1-0,15 mm., ihre Breite 0,12-0,14 mm. Mundsaugnapf 0.05-0,055 mm. Pharynx 0,01-0,013 mm. Der Bauchsaugnapf ist rund, beträgt 0,1-0,12 mm. Keimstock kugelig. Die Eier sind oval, filamentlos und haben eine glatte Eihülle mit doppelten Konturen; sie sind strohgelb; ihre Länge beträgt 0,017-0,019 mm., ihre Breite 0,01-0,011 mm. Wirt: *Mugil auratus* (Aegypt.).

2. **Mordvilkoviaster anisotremi** (MacCallum, 1921).

Die Länge der Parasiten 2,10 mm., seine Breite 0.80 mm. Mundsaugnapf 0,610 mm. Keimstock 0,200 mm. Hoden 0,176 mm. Die Eier sind 0,04 mm. lang und 0,021 mm. breit.

Keimstock liegt am hinteren Ende des Körpers. Hoden annähernd symmetrisch, hinter dem Bauchsaugnapf. Die Zweige des Darmkanals sind einfach, das hintere Ende des Parasiten erreichen sie nicht. Die Geschlechtsöffnungen liegen unter der Bifurkation des Darmkanals. Keimstock kugelig. Wirt: *Anisotremus virginicus* (New-York).

III Gatt. *APONURUS* Looss, 1907.

Vorder- und Hinterkörper deutlich voneinander geschieden, letzterer ungefähr zylindrisch. Maximalbreite und Dicke bei ganz erwachsenen Individuen auf der Höhe der Dotterstöcke. Cirrusbeutel birnförmig, dicht hinter dem Genitalporus beginnend; Pars prostatica kurz; schlauchförmig, von der Samenblase durch einen dünnen, nicht mit Drüsenzellen besetzten Gang getrennt. Samenblase noch vor dem Bauchsaugnapf. Metraterm fehlt oder äusserst kurz. Follikel des Dotterstocks unregelmässig kuglig, oft deutlich eine Gruppe von 3 und eine von 4 bildend. Die Schlingen des Uterus erfüllen hinter dem Dotterstock den ganzen verfügbaren Körperraum, bleiben dagegen weiter vorn auf den Raum zwischen den Darmschenkeln beschränkt. Parasiten im Magen und Oesophagus ihrer Wirte (Looss, 1907).

Typ. *A. laguncula* Lss., 1907.

B. Unterfam. **STERRHURINAE** Loss, 1907.

Kleine bis mittelgrosse Hemiuriden von mehr gedrungener Gestalt, mit dickem Soma und relativ dünnem Abdomen. Bauchfläche zwischen den beiden Saugnäpfen ausgehöhlt, bei eingebogenen Vorderkörper vor dem Bauchsaugnapf

von einem mehr oder minder tiefen Querspalt durchzogen. Mundsaugnapf von einer verschieden deutlich ausgebildeten Lippe überragt. Haut glatt, ohne Querleisten. Schenckel der Exkretionsblase im Vorderkörper vereinigt. Genitalporus nahe am Mundsaugnapf. Atrium kurz, Cirrusbeutel nicht allseitig geschlossen, sondern aus isolierten Muskelfasern bestehend, von birnförmiger oder kurz zylindrischer Gestalt; Samenblase S-förmig gebogen, mit dickem, sackförmigen Endabschnitt, noch vor dem Bauchsaugnapf. Metraterm deutlich ausgebildet und relativ land. Dotterstöcke klein, handartig geteilt (Looss, 1908).

I. Gatt. *STERRHURUS* Looss, 1907.

Mundsaugnapf rund, ohne besondere Ausstattungen, die ihn überragende Lippe vorhanden, aber weder besonders hervortretend noch besonders muskulös. Die Grube der Bauchseite fehlt. Der den Cirrusbeutel ersetzende Muskelsack umschliesst ausser dem Ductus hermaphroditus auch den Anfangsteil des Metraterms und den kurzen Ductus ejaculatorius, der seinerseits in den blasenartigen, das Hinterende des Cirrussacks einnehmenden Hohlraum übergeht. In diesen tritt von hinten die ausserhalb des Sacks gelegene Pars prostatica ein, wobei ihr innerer Belag muttermundartig in die Blase vorspringt. Eier ziemlich bauchig, wenig länger als dick (Looss, 1908).

Typ. *Sterrhurus musculus* Lss., 1907.

II. Gatt. *PLEURURUS* Looss, 1907.

Mundsaugnapf ohne Seitenwülste und ohne muskulöse Oberlippe. Bauchfläche zwischen den Saugnäpfen tief ausgehöhlt; die kleine Grube fehlt. Genitalporus nicht in der Mittellinie, sondern leicht seitlich, vom Mundsaugnapf etwas entfernt. Endorgan wie bei *Synaptobothrium*, jedoch ist die Pars prostatica nur kurz sackförmig, von wenigen Prostatazellen umgeben. Metraterm lang, dünn. Dotterstöcke der beiden Körperseiten weit voneinander getrennt, aus mittellangen Schläuchen zusammengesetzt (Looss, 1908).

Typ. *P. digitatus* Lss., 1899.

III. Gatt. *LECITHOCHIRIUM* Lühe, 1901.

Kleine bis mittelgrosse Formen mit meist ei- bis spindelförmigem Körper, rundem Querschnitt, glatter, nicht geringelter Haut und mittellangem (ungefähr ein Drittel der Rumpflänge erreichendem) Schwanzanhang. Cirrusbeutel vorhanden, umschliesst ausser dem Ductus hermaphroditus auch noch die Endabschnitte von Vas deferens und Metraterm. Das Vas deferens kann innerhalb des Cirrusbeutels local stark erweitert sein. Pars prostatica nicht im Cirrusbeutel mit eingeschlossen, kurz; Samenblase zu einem mehr oder weniger grossen Teil noch vor dem Bauchsaugnapf, zum Teil dorsal von demselben. Hoden symmetrisch, dicht hinter dem Bauchsaugnapf. Keimstock hinter denselben, kugelig oder (C. *L. digitatum* nach Looss schwach eingekerbt, meist nicht median, sondern seitlich verschoben, bald nach rechts, bald nach links. Dotter-

stöcke dicht hinter dem Keimstock, eventuell denselben noch ventral überlagernd, paarig, meist handförmig gespalten mit in der Regel 3-4 kurzen Schläuchen, seltener nur eingekerbt oder mit etwas längeren, zu einem Knäuel verschlungenen Schläuchen (Lühe, 1901).

Typ. *L. rufoviride* (R.) 1809.

IV. Gatt. *LECITHURUS* nov. gen.

Bauchsaugnapf mehr als anderthalbmal so gross als der Mundsaugnapf. Die Zweige des Darmkanals beendigen sich im Abdomen. Die Geschlechtöffnungen liegen unter der Pharynx. Hoden kugelig. Dotterstöcke handartig geteilt: die Lappen der Dotterstöcke sind dünn und relativ lang.

1. **Lecithurus lindbergi** (Layman) 1930. [2]

Die Länge der Würmer beträgt 3,60-5,24 mm.; ihre Breite 0,852-0,31 mm.; Formen mit wohlentwickeltem Abdomen. Mundsaugnapf ist 0,229-0,327 mm. im Diameter; der Bauchsaugnapf ist 0,409-0,606 mm. im Durchmesser. Pharynx ist 0,098-0,147 mm. lang und 0,981-0,147 mm. breit. Oesophagus ist sehr kurz. Die Zweige des Darmkanals enden im Abdomen. Die Geschlechtsöffnungen liegen hinten von Pharynx. Bursa cirri 0,376-0.458 mm. lang. Pars prostatica 0,737-0,835 mm. lang. Vesicula seminalis 0,590-0,655 mm. lang. Die ovalen oder runden Hoden haben eine regelmässige Form und sind gleich gross 0,295-0,376 mm. im Durchmesser. Keimstock auch rund oder oval, 0,229-0,14 mm. lang und 0,360-0,229 mm. breit. Dotterstöcke handförmig gespalten mit in der Regel 3-4 Schläuchen.

Eier 0,027-0,029 mm. lang und 0,0189-0,020 mm. breit

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[2] Layman Parasitische Würmer der Fische des Golfes Peter der Grosse. 1930 (Russ.)

Estudo critico sobre os Macucos brasileiros de cocoruto vermelho

Oliverio M. de Oliveira Pinto, D. M.
Museu Paulista — Brasil

Tinamus serratus serratus (Spix).

Pezus serratus Spix, 1825, Av. Bras., II, p. 61, pl. 76: «in sylvis campestribus fl. Nigri».

Tinamus brasiliensis Pelzeln, 1870 (*nec* Latham, 1890), Orn. Bras., p. 291: Rio Guaporé, Rio Madeira, Rio Negro.

Tinamus major Salvadori, 1895 (*nec* Gmelin, 1789), Cat. Bds. Brit. Mus., XXVII, p. 502. *partim* (só as femeas, com a descripção respectiva): Rio Negro (coll. Natterer).

Tinamus ruficeps Ihering, 1905 (*nec* Sclater & Salvin, 1873), Rev. Mus. Paul., VI, p. 5: Rio Juruá; Snethlage, 1914, Bol. Mus. Paraense, VIII, p. 47: Rio Purús (Bom Lugar).

Tinamus serratus Hellmayr, 1906, Abh. K. Bayer. Akad. Wiss., II. Kl., XXII, p. 699 (typos de Spix, crit.).

Tinamus serratus ruficeps Iher. & Ihering, 1907, Cat. das Av. Brasil, p. 5: Rio Juruá.

Tinamus serratus serratus Hellmayr, 1907, Novit. Zool., XIV, p. 419: Rio Madeira, (Humaytha); idem, 1910, Novit. Zool., XVII, p. 408: Rio Madeira (Calama).

N.º 16.423, macho ad., São Gabriel, 26 Nov. 1936. — Aza 220 mill., bico 30 mill.

A confusão em que tem vivido a nomenclatura dos macucos de cocoruto côr de ferrugem justifica o espaço, que abri, para a sua extensa synonymia. Hellmayr, no cerrado estudo critico que lhe dispensou em sua grande revisão dos typos de Spix, desde 1906 que poz a questão nos seus devidos termos, afastando definitivamente a possibilidade de corresponderem as ditas aves á especie que descrevera Gmelin sob o nome de *Tetrao major*, em contraposição ao que suppuzeram Salvadori e outros[1].

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[1] Hoje o nome de Gmelin, não obstante ser, em rigor, um *mixtum compositum*, como lhe qualifico o douto ornithologista de Vienna, é adoptado geralmente para a especie guyanense, a que Cabanis chamou posteriormente *Tinamus subcristatus* (Schomburgk, *Reise Brit. Guiana*, III, p. 749), procedimento este apoiado na circumstancia de se ter Gmelin baseado essencialmente em *Perdix brasiliensis* de Brisson, sobre cuja identidade não existe duvida.

Si a descripção e a estampa de Spix deixam ambas a desejar, legara-nos todavia Wagler (Syst. Av., *Crypturus*, sp. 2) uma rigorosa exposição dos caracteres do exemplar typico, infelizmente de ha muito perdido. Hellmayr, em seu trabalho supracitado, d'ella reproduz a passagem mais decisiva («fronte et toto capite supra saturate cupreo-castaneis... », provando, á evidencia, referir-se a especie de Spix á ave de que o Museu Paulista acaba de receber um bonito macho adulto, colleccionado em São Gabriel, no alto Rio Negro, pelo Snr. C. A. de Camargo. Proveniente da mesma região onde Spix obtivera o seu, elle pode ser considerado topotypico. Todo o alto da cabeça, desde a base do bico até a nuca, é de intensa côr de ferrugem, mais carregada ainda n'esta ultima, cujo limite posterior ultrapassa, de modo a se extender á porção adjacente do pescoço. Os lados da cabeça, inclusive os lóros, são de ferrugem mais clara, principalmente em correspondencia com a região superciliar e com a comissura do bico. As regiões auriculares, de ferrugineo quasi tão intenso quanto o do alto dorso, são de côr azeitonada, sem manchas, em contraste com o baixo dorso, que é pintado de manchas transversaes pretas, e se torna progressivamente mais arruivado, como o uropygio e as coberteiras supracaudaes, cuja extremidade apresenta uma pequena mancha clara distincta. O lado externo das azas é olivaceo como o dorso, com pintas transversaes pretas de variavel tamanho, exceptuadas porém as coberteiras grandes da mão e as secundarias, que são decididamente tingidas de ferrugem. A aza bastarda e as primarias são pardo-escuras. A garganta é de um branco quasi puro, em contraste com o pescoço, pardo-arruivado. No resto as partes inferiores são pardo-acinzentadas, manchadas de vermiculações escuras, mais densas no peito do que no abdomen, cuja parte central é de um cinzento claro quasi uniforme. As tibias são da côr do peito, porém tingidas de tons ruivos e pintadas de manchas transversaes escuras, mais largas e mais destacadas. As coberteiras infra-caudaes são pardo-olivaceas escuras, com largas faixas transversaes côr de ferrugem.

Estes caracteres concordam muito exactamente com os de um macho do alto Rio Juruá, trazido por E. Garbe, em 1902. N'este, as differenças mais notaveis residem no maior tamanho e abundancia das manchas pretas que ornam a plumagem de todo o lado dorsal, exceptuado apenas o alto da região interescapular. No mais coincide muito precisamente com a ave do Rio Negro, motivo pelo qual não tenho duvida de que pertençam á mesma especie. Um outro macho, tambem do Rio Juruá, já diverge por differenças muito mais accentuadas, mórmente no que respeita á coloração das partes inferiores e dos flancos, muito mais densamente pintados de manchas pardo-escuras. Isto mostra, quando muito, as largas variações individuaes de que a especie é susceptivel, não me parecendo licito referir estes exemplares á forma *ruficeps*, como fizeram Ihering com as do Rio Juruá, e Snethlage com as do Rio Purús. Tenho até minhas duvidas sobre a validez da raça equatoriana separada por Sclater & Salvin, cujas principaes differenças estão segundo Salvadori, que teve em mãos exemplares do Rio Negro caçados por Natterer, em «having the lower parts not so whitish, the breast and remainder of the lower parts being more olive-greyish », além de possuir nas tibias « constantly dusky bars, which are usually wanting in *T. major* ». Si já não fossem bastantes, para dizer do valor d'estas differenças, as que acima referi entre os dous exemplares do Rio Juruá (sem fallar n'uma femea da mesma procedencia, que, até certo ponto, occupa posição intermedia), ahi estariam um macho e uma femea do

Rio Manacapurú, affluente da margem esquerda do Rio Solimões, muito proximo portanto do Rio Negro, patria typica de *T. serratus*. Em ambos, as partes inferiores são mais claras. com especialidade o abdomen, que é quasi perfeitamente branco na parte central; por outro lado, a coloração quasi uniforme das tibias da femea contrasta com a plumagem densamente manchada d'aquella região, no macho.

É de notar-se que, no tocante pelo menos á côr clara do abdomen, os exemplares de Manacapurú se approximam mais da descripção de *T. serratus* dada por Salvadori do que o macho de São Gabriel. Acredito ainda que a ave de Spix, tanto pela estampa como pela descripção que nos deu, teria coincidido mais exactamente com este ultimo, que é um macho em plena maturidade. Os dous exemplares de Manacapurú. pelo contrario, são aves em estado de desenvolvimento incompleto, como nol-o demonstra a presença de pequenas manchas ocraceas ao longo da fimbria das secundarias e terciarias, caracter principalmente visivel no macho N.º 16.121. É assim mais que provavel seja a côr clara, quasi branca, da parte central do abdomen, uma peculiaridade da plumagem juvenil, que a edade progressivamente afasta.

Conclúo assim que, ainda que seja valida a raça *ruficeps*, ella será extranha ao territorio brasileiro. cujas aves devem pertencer todas á mesma forma descripta por Spix[2].

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[2] Mme. E. Snethlage está entre os autores que mais concorreram para complicar a questão, já de si intricada, que nos occupa. No seu conhecido "Catalogo das Aves Amazonicas" reconheceu ella nada menos de quatro especies entre os macucos de vertice ferrugineo, a saber: *Tinamus serratus* (Spix), *T. major* (Gmel.), *T. subcristatus* (Caban.) e *T ruficeps* Scl. & Salvin. Ás duas ultimas foram por ella referidas as aves, respectivamente, de Obidos e do Rio Purús [Bom Lugar]. Como porém não consigna nenhum exemplar ás duas primeiras, é crivel que o seu procedimento se originasse na falta de conhecimento objectivo d'ellas, pelo que se teria baseado, ao descrevel-as, exclusivamente no informe dos autores. Do acima exposto resulta que as especies chamadas pela distincta ornithologa *T subcristatus* e *T. ruficeps* se inclúem na synonymia de *T. major* e *T. serratus*, respectivamente.

Zur Erklärung der Configuration des Exkretionssystems in den freien Proglottiden von Wageneria proglottis und über die Berechtigung der Gattung Wageneria (Tetrarhynchidea)

Dr. Franz Poche

Wien, Obmann der Nomenklaturkommission des Verbandes Deutschsprachlicher Entomologen-Vereine.

Die Gattung *Wageneria* wurde von Monticelli, 1892 c, p. 11 für *Ligula proglottis* Wgenr. aufgestellt und als sehr wahrscheinlich den von ihm t. c., p. 1 so genannten *Cestodaria* (*Amphilinoinei* Poche, 1926 a, p. 241) zugehörig betrachtet. Von Benham, 1901, p. 97 wurde sie (irrtümlich *Wagneria* genannt) direkt der Familie *Amphilinidae* zugerechnet. Lühe, 1902 a, p. 248 erkannte jedoch ihre Natur als losgelöste Proglottiden, schloss sie wieder von den Cestodariern aus und stellte sie zu den *Tetraphyllidea* und Ohdner, 1904, p. 470 f. stimmte dieser Auffassung vollkommen bei.

1923 wies ich nach, dass von den drei bis dahin beschriebenen Arten von *Wageneria* zwei, nämlich *Wageneria porrecta* Lhe. und *Wageneria impudens* L. Cohn, mit Sicherheit und die dritte, *Wageneria proglottis* (Wgenr.), die typische Art der Gattung, die höchst unzulänglich bekannt ist, mit sehr grosser Wahrscheinlichkeit nicht zu den *Tetraphyllidea*, sondern zu den *Tetrarhynchidea* gehören. Die Zurechnung von *Wageneria* zu den *Tetrarhynchidea* ist auch seither von verschiedenen Autoren angenommen worden, so von Guiart, 1927, p. 399; id., 1931, p. 12 und Dollfus, 1929, p. 333 f.

E i n e n Punkt in Wageners Darstellung des Baues seiner *Ligula proglottis* musste ich aber damals ungeklärt lassen, eine Ungeklärtheit, die jedoch ganz unabhängig davon ist, ob diese Art den *Tetrachynchidea* oder aber den *Tetraphyllidea* zugerechnet wird. Wagener, 1854, p. 23, gibt nämlich für a l l e Exemplare von *Ligula proglottis* an, dass sich die Exkretionsgefässe nahe dem Hinterende zu einem unpaaren Kanal vereinigen, der dann am Hinterende ausmündet, und bildet dieses Verhalten auch bei zweien derselben ab (tab. 1, Fig. 11 und 12 b). — Ein solches Verhalten der Exkretionsgefässe in Proglottiden war zur Zeit des Erscheinens meines in Rede stehenden Artikels allerdings auch sonst schon bekannt, nämlich in der primären Endproglottis, aber auch nur in dieser. Wie ich jedoch bereits 1923, p. 21 darlegte, ist es gewiss nicht anzunehmen, dass die augenscheinlich ziemlich zahlreichen Wagener vorgelegenen abgelösten Proglottiden der genannten Species sämtlich primäre Endproglottiden gewesen sein sollten. — Diese Schwierigkeit musste damals, wie bereits erwähnt, ungeklärt bleiben.

Seither hat sich aber auch für sie eine völlig befriedigende Lösung ergeben. Bei Pintner, 1928, p. 319 findet sich nämlich die Angabe: „Es kommen bei hochgradig apolytischen Formen in den sich ablösenden Gliedern, wenn sie

hinten stark zugespitzt sind, Vereinigungen der beiden absteigenden Wassergefässe vor, die dann einen harnblasenartigen Endabschnitt mit terminalem Porus bilden; so bei *Bilocularia hyperapolityca* [errore pro: *hyperapolytica*] (s. Obersteiner 1915), bei der in den grossen, freien Gliedern der Endabschnitt mit dem gemeinsamen Porus genau so aussieht wie etwa bei *Dicrocoelium lanceatum*". — Dazu ist zu bemerken, dass sich bei Obersteiner l. c. allerdings weder im Text [s. insbesondere p. (116)] noch in den Abbildungen (s. insbesondere tab. IX, Fig. 1 u. 4) irgend eine derartige Mitteilung oder Darstellung findet; auf den Abbildungen ist das Exkretionssystem überhaupt nicht dargestellt, obwohl es von Obersteiner gesehen und beschrieben wurde [p. (116) u. (119)]. Nichtsdestoweniger ist die angeführte Angabe des ausgezeichneten Cestodenkenners ohne jedes Bedenken anzunehmen. Denn Obersteiners citierte Arbeit wurde unter der Anleitung Pintners und zur Gänze auf Grund diesem gehörenden Materials angefertigt, das weiterhin in dessen Händen blieb, sodass Pintner jederzeit in der Lage war, ergänzende Feststellungen daran vorzunehmen.

Um einen solchen Fall handelt es sich nun offenbar auch bei der oben angeführten Configuration des Exkretionssystems in den — bisher allein bekannten — abgelösten Proglottiden von *Wageneria proglottis*. Auch diese ist ja eine hyperapolytische Form, wie ich bereits 1923, p. 26 hervorgehoben habe; und ihre abgelösten Proglottiden sind hinten stark zugespitzt (s. Wagener, 1854, tab. 1, Fig. 11 u. 12 b). Sie entspricht also vollkommen den Bedingungen, unter denen nach Pintners oben angeführter interessanter Mitteilung in den sich ablösenden Proglottiden von Cestoden eine Vereinigung der beiden absteigenden Wassergefässe zu einem unpaaren Endabschnitt mit terminalem Porus vorkommt.

Ich habe im Vorstehenden von *Wageneria* wie von einer giltigen Gattung gesprochen. Denn bereits 1923, p. 26 legte ich dar, dass wir *Wageneria* mit grosser Wahrscheinlichkeit als ein eigenes, bisher nur in einzelnen Proglottiden bekanntes Genus hyper (oder ? eu) apolytischer Tetrarhynchideen anführen können. [Der Zusatz „(oder ? eu)" trug dabei der von mir l. c. angeführten Möglichkeit Rechnung, dass die Strobilae von *Wageneria impudens* L. Cohn euapolytisch sind]. Diese Auffassung vertrat ich dann auch 1926 a, p. 365.

Es ist mir allerdings wohl bekannt, dass seither einzelne Autoren zwar die Zugehörigkeit von *Wageneria* zu den *Tetrarhynchidea*, nicht aber deren Existenzberechtigung als eine eigene Gattung anerkannt haben. Insbesondere sagt Guiart, 1927, p. 399 in der Diagnose der von ihm daselbst aufgestellten Familie *Lacistorhynchidae*: „anneaux mûrs à côtes longitudinales, souvent très allongés, parfois cylindriques et vivant longtemps après s'être détachés du strobile, ce qui les a fait prendre pour des Cestodaires ou Cestodes monozoïques (g. *Wageneria*)"; und in seiner Aufzählung der Gattungen dieser Familie führt er *Wageneria* nicht an. Ebenso sagt er 1931, p. 12 von letzterer: „Pintner et moi avons montré qu'il s'agit d'anneaux mûrs de *Lacistorhynchidae*, susceptibles de vivre longtemps après s'être détachés du strobile; le genre *Wageneria* doit donc disparaître".

Diese Angaben Guiarts sind aber in mehrfacher Hinsicht unrichtig. Zunächst hat Pintner niemals gezeigt, dass es sich bei *Wageneria* um reife Glieder von *Lacistorhynchidae* handelt. Vielmehr sagt er an der von Guiart offenbar im Auge gehabten (weil allein in Betracht kommenden) Stelle (1913, p. 224) diesbezüglich lediglich von den freien Proglottiden, die Zschokke, 1888, p. 298-

305, tab. VIII, Fig. 122-126 beschrieb und abbildete und auf einen von ihm vermutungsweise (s. p. 294) mit *Tetrabothrium erisoum* Molin identifizierten Cestoden bezog: „Nach dem, was wir heute wissen, können wir mit Bestimmtheit sagen: diese freien Proglottiden, die Zschokke beschreibt, gehören nicht zu einer Tetraphyllide, sondern sie gehören zu einem *Tetrarhynchus*. Das wird bewiesen: ... Wahrscheinlich gehören die Glieder zu *Tetrarhynchus benedeni* Crety" [der typischen Art von *Lacistorhynchus*]. Von *Wageneria* ist dabei also überhaupt mit keinem Worte die Rede. Und Guiart hat zwar 1927, p. 399 (s. oben p.) gesagt, dass *Wageneria* reife Glieder von *Lacistorhynchidae* darstellt; aber gezeigt hat auch er dies in keiner Weise. Und wenn es gezeigt worden wäre oder gezeigt würde, so würde daraus vollends nicht folgen, dass die Gattung *Wageneria* verchwinden muss. Denn sie ist ja bedeutend älter als jede der beiden Gattungen, die Guiart selbst (l. c.) dieser Familie zurechnet. Ist sie also mit einer derselben identisch, so muss daher selbstverständlich nicht etwa *Wageneria*, sondern diese letztere eingezogen werden. Mit vollem Recht hat auch schon Dollfus, 1929, p. 334 darauf hingewiesen, dass man bei strenger Befolgung der Nomenklaturregeln, wenn mit Sicherheit nachgewiesen würde, dass *Wageneria proglottis* eine Proglottide von *Lacistorhynchus* ist, den Namen *Lacistorhynchus* Pintner, 1913 zugunsten von *Wageneria* Monticelli, 1892 aufgeben müsste. Er setzt allerdings hinzu: „Ce serait là un abus du recours à la loi de priorité", Diese letztere rein subjektive Ansicht Dollfus', für die er auch keinerlei Begründung gibt, kann aber selbstverständlich an der sich nach seinen eigenen Worten auf Grund der Nomenklaturregeln eventuell ergebenden Notwendigkeit der Einziehung des Namens *Lacistorhynchus* zu Gunsten von *Wageneria* nicht das Geringste ändern. (Ueberdies ist es auch keineswegs einzusehen, warum diese eventuelle Verwerfung des Namens *Lacistorhynchus* zugunsten von *Wageneria* ein „Missbrauch der Zuflucht zum Prioritätsgesetz" sein sollte. Denn *Wageneria* ist nicht etwa ein fast unbekannter, bisher beinahe niemals gebrauchter Name, sondern wurde in einer ganzer Reihe neuerer Publikationen als giltiger Name gebraucht [s. u. a. auch die Citate in Poche, 1923, p. 20 f.] und ist — schon infolge der seinerzeitigen Zurechnung der Gattung zu der sehr interessanten kleinen Gruppe der Cestodarier — mindestens ebenso bekannt wie der Name *Lacistorhynchus*. Und auch der Umstand, dass *Wageneria* nur auf einen Teil eines Tieres, *Lacistorhynchus* dagegen auf das ganze Tier gegründet ist, steht der Anwendung des Prioritätsgesetzes im Falle der erwiesenen Synonymie dieser beiden Namen keiner Weise entgegen, da in Art. 27 der Nomenklaturregeln ausdrücklich — und mit vollem Recht — vorgesehen ist, dass das Prioritätsgesetz auch in solchen Fällen gilt.). Ist dagegen im Falle des Nachweises, dass *Wageneria* reife Glieder von *Lacistorhynchidae* darstellt, sie mit keiner der anderen Gattungen dieser Familie identisch, so kommt eine Einziehung des in Rede stehenden Genus von vornherein überhaupt nicht in Frage.

Auf die Frage der Identität von *Wageneria* mit einer der anderen der bisher aufgestellten Gattungen der *Tetrarhynchidea* gedenke ich binnen kurzem an anderer Stelle einzugehen.

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The Monogenetic Trematodes of Latin America

Emmett W. Price

Bureau of Animal Industry, U. S. Department of Agriculture — U. S. A.

[With 2 plates]

Recently Dr. Carlos Chavarría, Jefe del Departamento de Parasitologia, Centro Nacional de Agricultura, San Pedro Montes de Oca, Costa Rica, forwarded to the Bureau of Animal Industry for examination a fish infested with the metacercaria of *Clinostomum* sp. In the course of examining this fish, the gills were found to be infested with two species of monogenetic trematodes belonging to the genus *Cleidodiscus* Mueller. In connection with a study of these parasites, a review of the literature reveals that up to the present time only five species of Monogenea have been described from countries south of the United States. The purpose of this paper is, therefore, to call attention to these species, as well as to present descriptions of the two forms from Costa Rica and redescriptions of three species of which only two previously had been reported from Latin American countries.

Superfamily *GYRODACTYLOIDEA* Johnston & Tiegs, 1922.

Family *DACTYLOGYRIDAE* Bychowsky, 1933.

Subfamily *TETRAONCHINAE* Monticelli, 1903.

Ancyrocephalus atherinae Price, 1934.

This species was described by the writer (1934) from specimens collected from the gills of *Atherina araea* Jordan & Gilbert taken in Samaná Bay, near Santa Barbara de Samaná, Dominican Republic. About one-third of all specimens of this fish were found to be infested but only two or three individuals were found on each fish.

Cleidodiscus travassosi n. sp.

(Pl. 1, figs. 1-3).

Description. — Body fusiform, 190 to 215 microns long by 75 to 85 microns wide; anterior end with several pairs of head organs. Haptor somewhat discoid, 30 to 38 microns long by 50 to 56 microns wide, bearing 2 pairs of large hooks separated by bars, and 14 marginal hooklets. Ventral hooks 20 microns long, dorsal hooks 17 microns long; marginal hooklets about 6 microns long; ventral bar V-shaped, dorsal bar curved. Oral aperture ventral, about 35 microns from anterior end of body; pharynx globular, 20 microns in diameter; intestine

double, uniting posteriorly. Eyes present, 2 pairs, posterior pair larger. Genital aperture median, 55 to 75 microns from anterior end of body. Cirrus tubular, slender, lying in a three-turn corkscrew spiral; acessory piece apparently present, but the details of its structure not ascertainable in available material. Testis oval, occupying greater part of interintestinal field posterior to middle of body. Ovary linguiform, ventral to testis. Vitelline follicles relative large, occupying greater part of lateral fields from level of posterior border of pharynx to slightly beyond union of intestine. Vagina present, opening on left body margin in equatorial zone. Egg not observed.

HOST: — *Rhamdia rogersi* (Regan).
LOCATION: — Gills.
DISTRIBUTION: — Costa Rica (San Pedro Montes de Oca).

Cleidodiscus chavarríai n. sp.
(Pl. 1, figs. 4-6).

Description. — Body somewhat fusiform, 247 microns long by 80 microns wide; anterior end rounded, with several pairs of head organs. Haptor somewhat discoid, 45 microns long by 72 microns wide, armed as in other species of genus. Ventral hooks 30 microns long; dorsal hooks 26 microns long; hooklets 15 microns long; ventral bar straight, dorsal bar curved. Oral aperture ventral, 35 microns from anterior end of body; pharynx globular, 20 microns in diameter. Intestine as in *C. travassosi*. Eyes present, 2 pairs, usually consisting of scattered masses of pigment. Genital aperture median, 57 microns from anterior end of body. Cirrus tubular, slender, lying in a two-turn helical spiral; accessory piece consisting of two parts joined at their bases, the right portion bifid and the left portion cornuate. Testis and female organs as in *C. travassosi*. Eggs not observed.

HOST: — *Rhamdia rogersi* (Regan).
LOCATION: — Gills.
DISTRIBUTION. — Costa Rica (San Pedro Montes de Oca).

Both *Cleidodiscus travassosi* and *C. chavarríai* were present in small numbers in the single specimen of fish examined. In general appearance both species are quite similar but may easily be differentiated from each other, as well as from other species in the genus, by the structure of the male copulatory organs and by the shape of the haptoral bars.

Family *CALCEOSTOMATIDAE* (Parona & Perugia, 1890).

Fridericianella ovicola Brandes, 1894.

This species was described by Brandes (1894) from specimens collected by Dr. v. Ihering from the eggs of *Arius commersonii* from the Rio Grande do Sul, in Brazil. The male of this fish carries the eggs in its mouth until the emergence of the young, and this habit probably explains the occurrence of the parasites on the eggs; *F. ovicola* is in all probability a parasite of the mouth or gills of the fish.

Superfamily *CAPSALOIDEA* Price, 1936.

Family *ACANTHOCOTYLIDAE* Price, 1936.

Subfamily *ACANTHOCOTYLINAE* Monticelli, 1903.

Lophocotyle cyclophora Braun, 1896.

This species was described by Braun (1896), the material upon which it was based consisting of two specimens collected in 1892 at « Navarin, Puerto Toro, wahrscheinlich der Haut einer *Notothenia* », by the Hamburg Magellan Expedition. The specimens apparently were not in good condition as certain features of the worm were not well described. The general appearance, however, indicates that the species is closely related to members of the genus *Acanthocotyle*.

Family *CAPSALIDAE* Baird, 1853.

Subfamily *BENEDENIINAE* Johnston, 1929.

Benedenia hendorffii (Linstow, 1889) Stiles & Hassall, 1908.
(Pl. 2, figs. 1-2).

Synonyms. — *Phylline hendorffii* Linstow, 1889; *Epibdella hendorffii* (Linstow, 1889) Monticelli, 1891; *E. (Phylline) hendorffii* (Linstow, 1889) Heath, 1902; *E. (Benedenia) hendorffii* (Linstow, 1889) Linstow, 1903; *Benedenia (Parabenedenia) hendorffii* (Linstow, 1889) Johnston, 1929.

Description. — Body elliptical, 9 mm. long by 5 mm. wide. Anterior haptors somewhat ovoid, 1 mm. long by 0.795 mm. wide; posterior haptor sucker-like, 2.7 mm. long by 3 mm. wide, surrounded by a delicate marginal membrane 295 microns wide at anterior margin of haptor, narrower posteriorly; ventral surface of haptor smooth and armed with 3 pairs of hooks and 14 marginal hooklets. Hooks of first pair somewhat spearhead-shaped, 480 microns long, striated longitudinally; hooks of second pair slender, curved, 630 microns long, posterior ends recurved; hooks of third pair slender, 150 microns long, points fine and recurved; marginal hooklets 12 microns long. Oral aperture median, 1.2 mm. from anterior end of body. Pharynx 850 microns long by 900 microns wide; esophagus very short; intestinal tract with numerous lateral and median diverticula. Eyes present, 2 pairs, antero-dorsal to pharynx. Common genital aperture at level of posterior margin of left anterior haptor. Cirrus pouch long and slender, its base to right of median line posterior to pharynx, enclosing large prostatic reservoir and muscular, finger-shaped cirrus. Testes globular, 850 microns in diameter, equatorial. Ovary globular, 765 microns in diameter, median and immediately pretesticular. Vitelline follicles extending into cephalic lobe. Vagina slender, opening a short distance posterior to common genital aperture. Oötype immediately posterior to cirrus pouch; metraterm slender. Egg not observed (157 microns wide, according to Linstow).

HOST: — *Coryphaena hippurus* Linn.

LOCATION: — Skin.
DISTRIBUTION: — Chile and United States (Spokane, Washington).

This species was originally described by von Linstow (1889) from specimens collected at « Caleta buena, Chile » (lat. 19° 55' S, long. 70° 9' W). The above description is based on a single specimen (U. S. Nat. Mus., N.° 35,637) collected by Dr. E. E. Wehr from an undetermined species of fish at Spokane, Washington. This specimen agrees in almost every detail with the description given by von Linstow and there appears to be no doubt that the species described here is the same as that described from Chile.

B. hendorffii resembles in many respects a species described by Yamaguti (1934) as *Epibdella seriolae* (= *B. seriolae* (Yamaguti). n. comb.) from Japan. The two species may be distinguished, however, by the presence of a band of vitelline follicles between the ovary and testes in *B. seriolae*, which is absent in *B. hendorffii*, and also by the shape of the hooks of the second pair which are more slender and not as curved in *B. hendorffii* as in *B. seriolae*.

Subfamily *CAPSALINAE* Johnston, 1929.

Capsala laevis (Verrill, 1874) Johnston, 1929.

(Pl. 2, figs. 3-7).

Synonyms. — *Tristoma laeve* Verrill, 1874; *T. histiophori* Bell, 1891; *T. laeve* var. *armata* Goto, 1899.

Description. — Body almost circular, about 11 mm. in diameter; dorsal surface convex and smooth except for a single row of 3- to 4-cuspid spines 38 microns long by 20 microns wide near lateral margins of body; ventral surface concave and covered with numerous conical papilliform projections. Anterior haptors circular, concave, about 2 mm. in diameter, with small papilliform projections in depth of cavity. Posterior haptor disc-like, about 3.4 mm. in diameter, surrounded by festooned marginal membrane 170 microns wide; ventral surface with irregularly distributed papilliform projections; central area an irregular heptagon with 7 ridges radiating from it as in other capsalids; hooks slightly curved, 510 microns long; marginal hooklets 14 in number, 19 microns long. Oral aperture median, near level of posterior margins of anterior haptors; pharynx constricted 1.1 mm. by 1.5 mm.; intestine as in other capsalids. Eyes present, 2 pairs, antero-dorsal to pharynx. Genital aperture immediately posterior to distal margin of left anterior haptor. Cirrus pouch club-shaped, its base to right of median line immediately posterior to base of pharynx; cirrus covered with small, oval, wart-like elevations when everted. Testes very numerous, occupying interintestinal field and extending into extra-intestinal field beyond limits of lateral longitudinal nerves. Ovary lobulate, about 1.2 mm. long by 1.7 mm. wide, median, about 1 mm. posterior to base of pharynx. Vitelline follicles occupying greater part of body and extending into cephalic lobe. Vagina slender, opening about 900 microns postero-median of genital aperture. Oötype ovoid, immediately posterior to cirrus pouch. Egg quadrangular, 84 microns wide, with 2 lateral processes 38 microns long and a posterior process 100 microns long.

HOST: — « Dorado », probably *Coryphaena hippurus* Linn.
LOCATION: — Not given.
DISTRIBUTION: — Brazil (Ilha Victoria, São Paulo).

Capsala laevis (syn. *Tristoma laeve*) was originally described by Verrill (1875) from specimens collected from *Tetrapturus imperator* at Block Island. This description was very inadequate as was the illustration published later by him (Verrill, 1885). In 1891, Bell described as *Tristoma histiophori* a species based on specimens collected by Mr. F. Day from *Histiophorus brevirostris* at Madras, and Goto (1894) described as *Tristoma ovale* a species from the mouth cavity of *H. orientale*, *H.* sp., and ? *Cybium* sp., from Japan. In the description of *T. ovale*, Goto pointed out that his species might eventually prove identical with *T. histiophori* Bell, and Setti (1899), after examining specimens of Bell's species, concluded that *T. ovale* Goto, *T. histiophori* Bell, and *T. laeve* Verrill were synonymous. This conclusion also was arrived at independently by Goto (1899) after an examination of specimens of *T. laeve* and *T. histiophori*. In view of the fact that dorsal marginal spines were totally absent from the specimens of *T. ovale* and present on *T. laeve* and *T. histiophori*, Goto proposed to recognize two varieties of *T. laeve*, naming the form represented by his *T. ovale* as « var. *inermis* » and that represented by *T. laeve* as « var. *armata* ». In spite of the fact that *T. ovale* and *T. laeve* are almost identical except for the absence in the former of dorsal marginal spines (« chitinous bodies »), the present writer is of the opinion that the presence or absence of these spines are of specific value and proposes to retain Goto's form as a distinct species, *Capsala ovale* (Goto) n. comb.

The present description of *Capsala laevis* is based upon three specimens in the U. S. National Museum (N.º 18871) labelled « 974 Ilha (sic) Victoria, Staat S. Paulo, 1906, Fr. Gunther, Parasit Meerfische 'Dorado' ». These specimens have been carefully compared with a specimen (U. S. N. M., N.º 7179, labelled « type ») of *C. laevis* (Verrill) and the writer is convinced that, in spite of the fact that the specimens from Brazil are slightly larger than the Block Island specimen, the two forms are identical.

Capsala poeyi (Vigueras, 1935), n. comb.
(Pl. 2, figs. 8-10).

Synonym. — *Tristomum poeyi* Vigueras, 1935.

Description. — Body slightly oval to almost circular in outline, 10 to 12 mm. long by 8 to 10 mm. wide; dorsal surface convex, with single row of 1-3-cuspid spines near lateral margins (60 to 65 spines on each side); ventral surface concave, smooth. Anterior haptors circular, concave, 1.9 to 2 mm. in diameter. Posterior haptor similar to that in other capsalids, 3 to 3.1 mm. in diameter; ventral surface with numerous radiating rows of papillae; hooks slightly curved 500 to 670 microns long; marginal hooklets 14 in number, about 20 microns long. Pharynx constricted 0.88 to 1.1 mm. by 0.96 to 1.3 mm.; digestive system as in other species of genus. Eyes present, 2 pairs, antero-dorsal to pharynx. Genital aperture sinistral, about 0.96 to 1.4 mm. from lateral margin. Cirrus pouch 1.5 to 2 mm. long, situated as in *C. laevis*. Testes very numerous, extending slightly beyond limits of lateral longitudinal nerves. Ovary lobulated,

0.96 long by 1 to 1.1 mm. wide. Vitellaria distributed as in *C. laevis*. Vagina slender, opening near genital aperture. Oötype oval, immediately posterior to cirrus pouch. Egg not observed.

HOST: — *Makaira ampla* (Poey).
LOCATION: — Skin.
DISTRIBUTION: — Cuba (Havana).

This species was proposed by Vigueras (1935) and, except for failure to mention the presence of the dorsal marginal spines and the marginal hooklets of the posterior haptor, the description was very complete. The description given above is based upon a part of the cotype specimens which Professor Vigueras very generously donated to the Helminthological collection of the U. S. National Museum.

Capsala poeyi is closely related to *Capsala laevis* (Verrill) from which it differs as follows: Posterior haptor smaller in relation to body size; ventral surface of posterior haptor covered with radiating rows of papillae instead of irregularly arranged papillae; ventral surface of body smooth instead of bearing prominent papillae; and vaginal orifice close to common genital aperture instead of some distance postero-median as in *C. laevis*.

In placing this species in the genus *Tristomum*, Vigueras was apparently unaware of Johnston's (1929) paper in which he traced the synonimy of certain of the tristomatid genera and concluded that the genus *Tristoma* Cuvier, 1817, was a synonym of *Capsala* Bosc, 1811. In reviewing the species of tristomes the writer (Price, 1936) proposed to retain both *Capsala* Bosc and *Tristoma* Cuvier as valid genera and added a third genus, *Capsaloides*, for certain species showing essential differences from the types of both of the older genera. In spite of considerable similarity between these genera, the groups are quite distinct and may easily be separated by the following key:

1.	Pharynx with constriction; testes usually, if not always, extending into extraintestinal fields	*Capsala* Bosc.
	Pharynx without constriction; testes confined to inter-intestinal field	2.
2.	Distal rays of posterior haptor bifid; haptoral hooks with claw-like tips; dorsal marginal spines crown-shaped, in single longitudinal row	*Capsaloides* Price.
	Distal rays of posterior haptor not bifid; haptoral hooks without claw-like tips; dorsal marginal spines, when present, not crown-like, in numerous short transverse rows	*Tristoma* Cuvier.

These genera contain the following species:

Capsala Bosc, 1811: *C. martinieri* Bosc [type, probably identical with *C. molae* (E. Blanchard)]; *C. biparasitica* (Goto); *C. foliacea* (Goto); *C. interrupta* (Monticelli); *C. katsuwona* (Ishii); *C. laevis* (Verrill); *C. magrona* (Ishii); *C. megacotyle* (Linstow); *C. nozawae* (Goto); *C. onchidiocotyle* (Setti); *C. ovale*

(Goto); *C. pelamydis* (Taschenberg); *C. poeyi* (Vigueras); and possibly also *C. squali* (E. Blanchard), which is at present unrecognizable.

Capsaloides Price, 1936: *C. cornutum* (Verrill) (type); *C. sinuatum* (Goto); and *C. perugiai* (Setti).

Tristoma Cuvier. 1817: *T. coccineum* Cuvier (= *T. papillosum* Diesing (type); *T. integrum* Diesing (= *T. coccineum* of authors); *T. levenseni* Monticelli; and *T. uncinatum* Monticelli.

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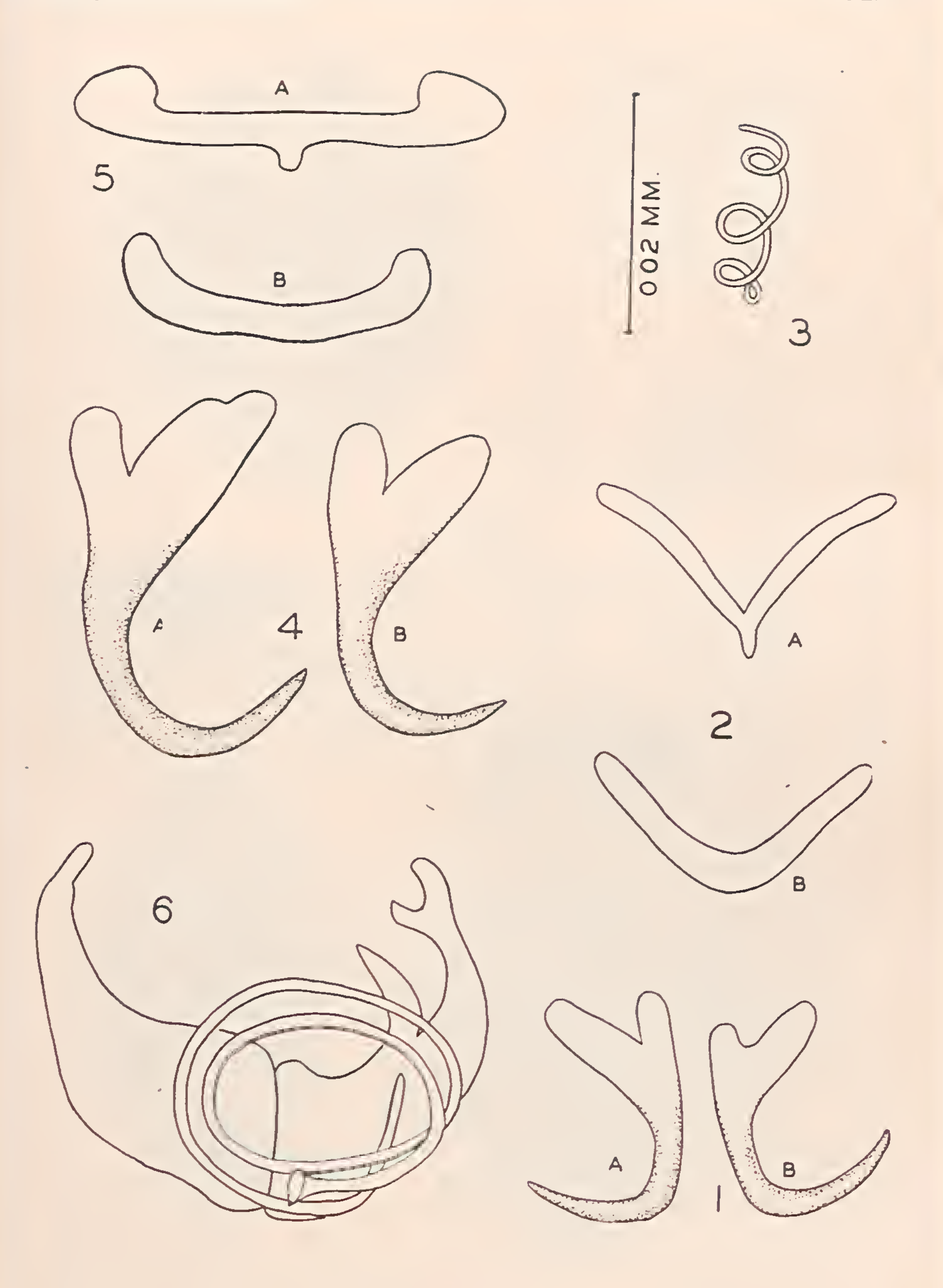
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Plate 1

Figs. 1-3 — *Cleidodiscus travassosi.* 1, Large haptoral hooks (A — hook of ventral pair, B — hook of dorsal pair); 2, haptoral bars (A — ventral bar, B — dorsal bar); 3, cirrus.

Figs. 4-6 — *Cleidodiscus chavarríai.* 4, Large haptoral hooks (A — hook of ventral pair, B — hook of dorsal pair); 5, haptoral bars (A — ventral bar, B — dorsal bar); 6, cirrus and accessory piece.

(Figures drawn to same scale).



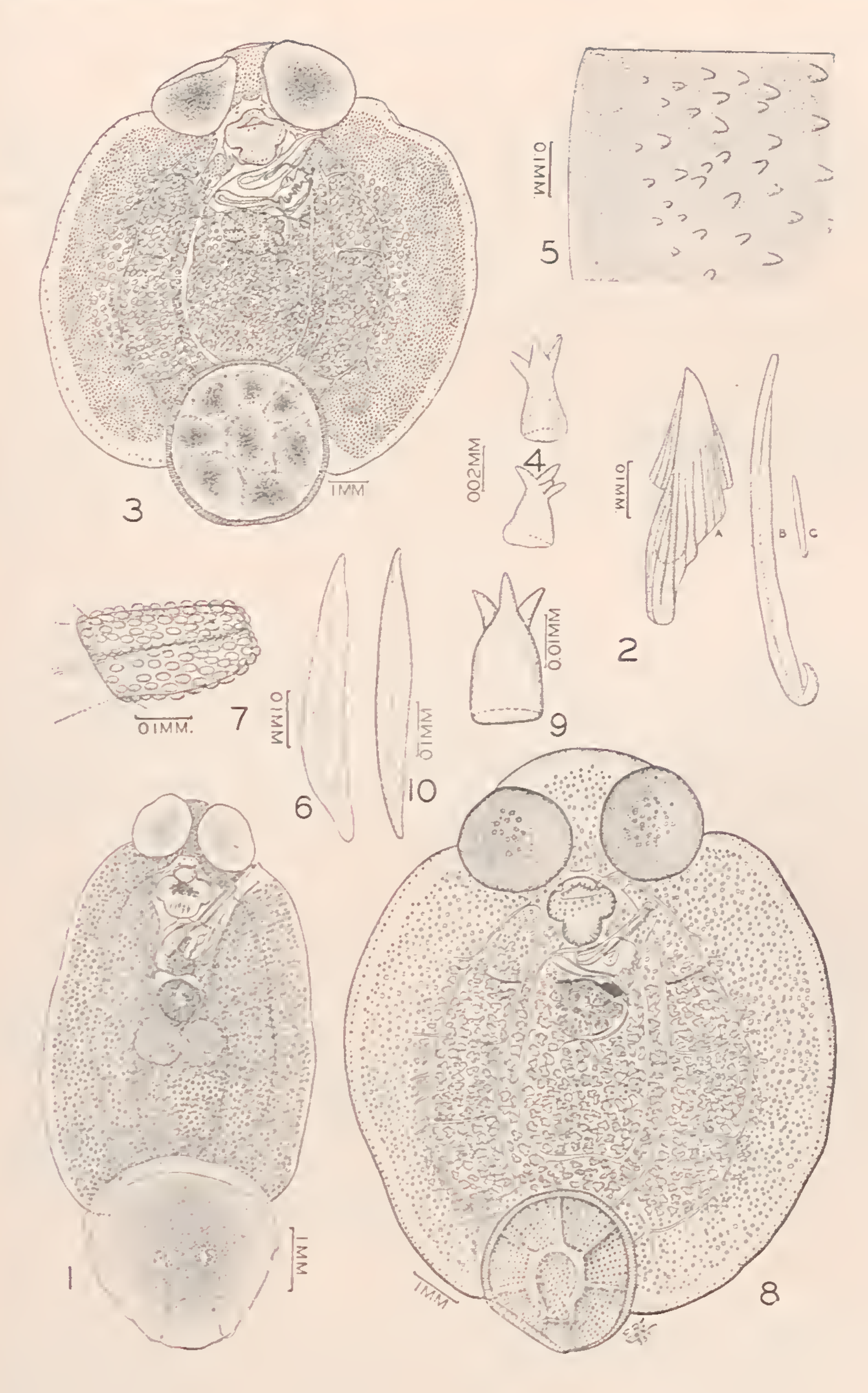
Price: The Monogenetic Trematodes of Latin America.

Plate 2

Figs. 1-2 — *Benedenia hendorffii.* 1, Complete worm, ventral view; 2, haptoral hooks (A — hook of first pair, B — hook of second pair, C — hook of third pair).

Figs. 3-7 — *Capsala laevis.* 3, Complete worm, ventral view; 4, dorsal marginal spines; 5, portion of ventral surface showing distribution of papillae; 6, haptoral hook; 7, cirrus.

Figs. 8-10 — *Capsala poeyi.* 8, Complete worm, ventral view; 9, dorsal marginal spine; 10, haptoral hook.



Price: The Monogenetic Trematodes of Latin America.

Terceira Contribuição para o Conhecimento Microscopico dos residuos fecaes de Origem Alimentar

R. di Primio

Faculdade de Medicina de Porto Alegre, Rio Grande do Sul — Brasil

[Com 8 figuras no texto]

Esta contribuição, como as anteriores, visa o reconhecimento dos residuos fecaes de origem alimentar, após regimens especiaes. Os desenhos representam exclusivamente os elementos observados nas fezes.

ACELGA

Beta vulgaris Linn.

Os residuos da acelga apresentam-se, principalmente, sob dois aspectos. Uns pertencem ao parenchyma, constituido de cellulas irregularmente polygonaes, alongadas ou arredondadas, de protoplasma hyalino, homogeneo ou, então, com granulações geralmente dispostas no centro ou em faixa, seguindo o seu grande eixo. Tem, como dimensões medias, 75 micra de comprimento e 35 micra de largura (fig. 1).

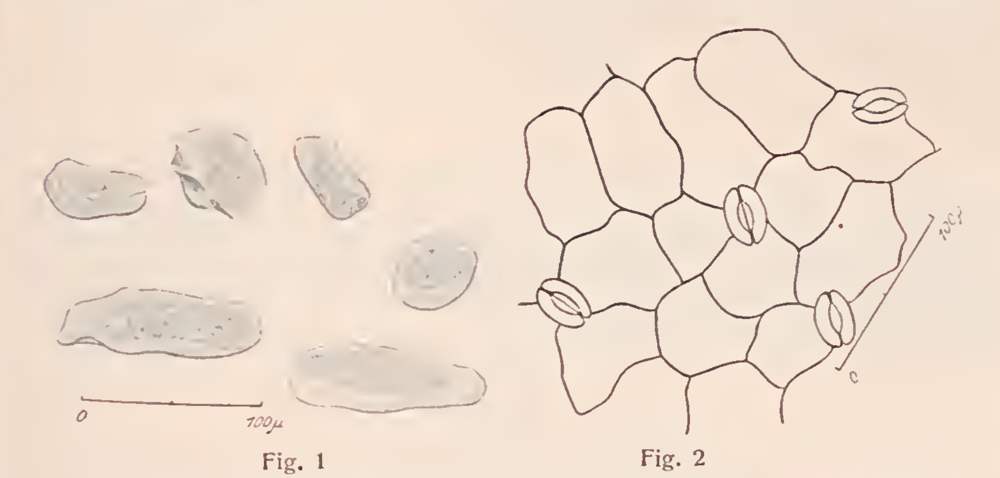


Fig. 1 Fig. 2

Outros provêm da parte externa da epiderme, formada de cellulas polygonaes, com algumas variações quanto á forma e dimensões, contiguas, tendo, em media, 60 micra de comprimento e 30 micra de largura (fig. 2).

Os estomatos, perfeitamente ovaes, sem direcção geral uniforme, comprehendidos entre tres a quatro cellulas, têm, como medias, 30 micra de comprimento e 20 micra de largura.

REPOLHO

Brassica oleracea capitata

Além de outros elementos que entram na constituição geral dos vegetaes, sem maior significação diagnostica, encontram-se nas fezes, como residuos do repolho, grandes cellulas ovaes ou polygonaes, de protoplasma hyalino, limitado por uma membrana delgada, com dimensões medias de 111 micra de comprimento e 70 micra de largura (fig. 3).

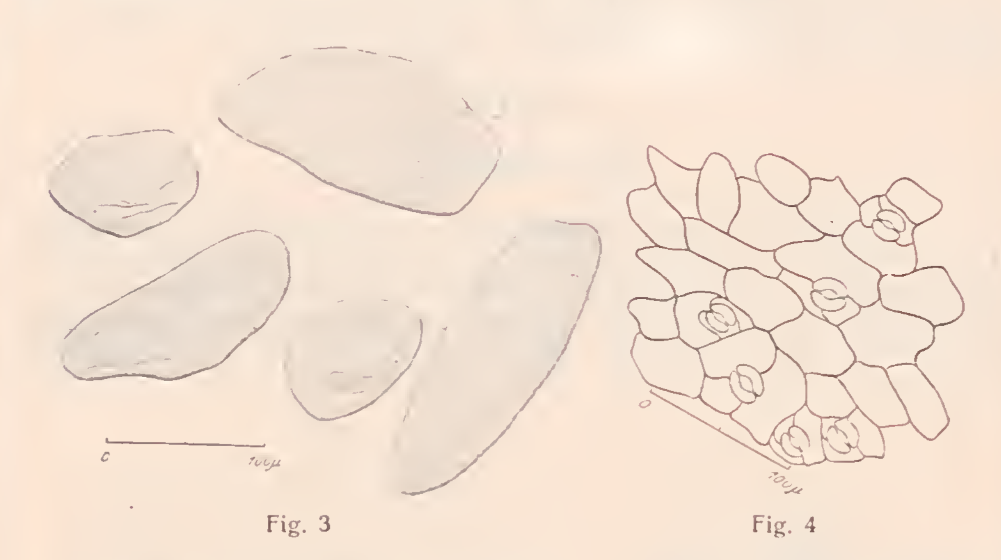


Fig. 3 Fig. 4

Outro residuo encontrado é representado pela epiderme das folhas, formada de cellulas polygonaes tendo dimensões medias de 50 micra de comprimento e 30 micra de largura, com estomatos situados entre 3 a 4 cellulas, sem direcção determinada, apresentando fenda central arredondada, symetricamente ligada aos polos e dimensões medias de 20 micra de comprimento por 18 micra de largura (fig. 4).

INHAME

Colocasia antiquarum Schott.

Os residuos da parte central do inhame de maior importancia, além de outros elementos não caracteristicos, são constituidos de grandes cellulas ovaes ou arredondadas, com dimensões medias de 80 micra de comprimento

e 60 micra de largura, de protoplasma hyalino ou granuloso, granulações essas reunidas ou disseminadas (fig. 6).

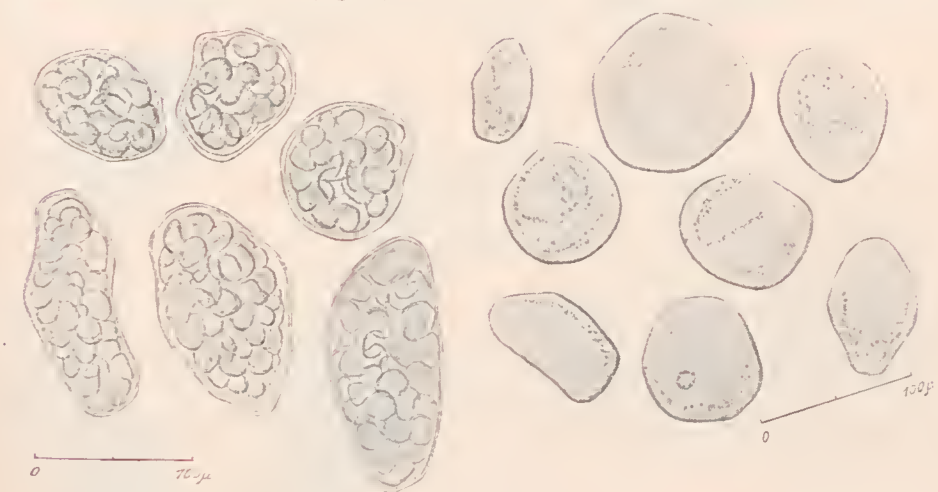


Fig. 5 Fig. 6

LENTILHA

Lens esculenta Moench.

As cellulas do parenchyma nutritivo são polygonaes, algumas irregulares, geralmente alongadas, ovaes ou arredondadas com as dimensões medias de 100 micra de comprimento por 70 micra de largura, de paredes pouco espessas e aspecto geral semelhante ás cellulas correspondentes ao feijão commum. O colorido varia do pardo escuro, amarellado ou, então, completamente descorado, dependendo essas modificações e outras dos diversos phenomenos que occorrem no tubo digestivo (fig. 5).

ROMÃ

Punica granatum L.

A romã fornece poucos residuos, como consequencia da constituição da parte comestivel. Podem, ser encontrados fragmentos da pellicula das sementes, constituida de cellulas irregularmente polygonaes, com limites rectos ou pouco curvos, de protoplasma homogeneo, sem grandes caracteristicas, tendo, como dimensões medias, 110 micra de comprimento e 120 micra de largura (fig. 7).

CASTANHA DO PARÁ

Bertholettia excelsa Humb. & Bomp.

Como residuos da castanha do Pará encontrados nas fézes, são fragmentos pequenos da pellicula que a envolve, de côr amarellada ou parda,

mais ou menos escura, e que pela sua constituição cellulosica resiste melhor á acção dos succos digestivos (fig. 8).

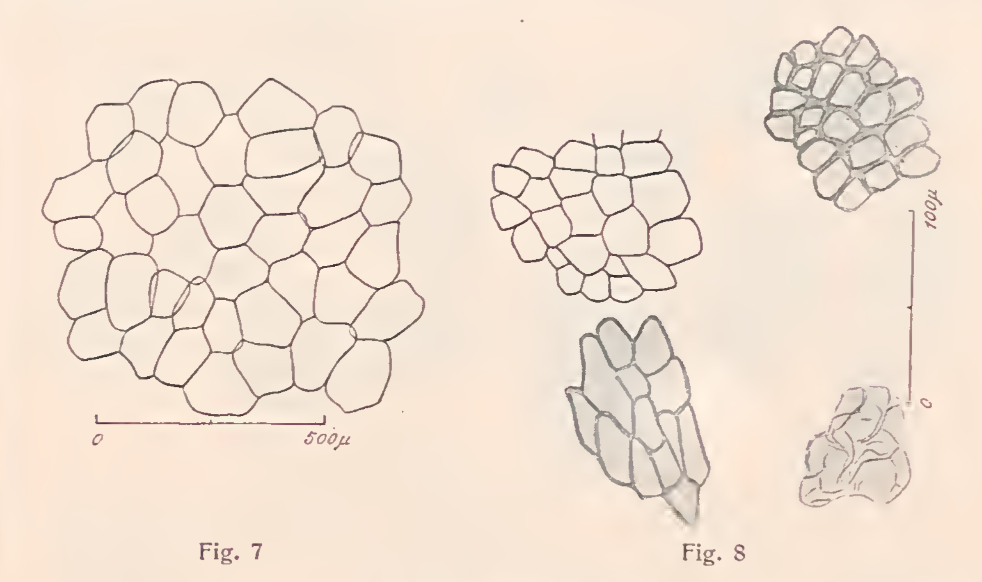


Fig. 7 Fig. 8

Da parte comestivel, fragmentos de dimensões variaveis, quando não soffrem a desagregação, principalmente nos casos anormaes ou de perturbações digestivas, como demonstração da sua constituição, apparecem numerosas gotticulas de gordura.

Sobre um novo typo de Heterakinae Railliet & Henry, 1912

(Nematoda: Subuluroidea)

M. Cavalcanti Proença
Instituto Oswaldo Cruz, Rio de Janeiro – Brasil

[Com 1 estampa]

No presente artigo descrevemos um interessante nematodeo que deve constituir um novo genero da sub-familia *Heterakinae* Railliet & Henry, 1912, colhido pelo Prof. Lauro Travassos, em 1916, no intestino grosso de *Dasypus sexcinctus* L., proveniente de Angra dos Reis, Estado do Rio (Brasil), e posteriormente, em 1921, do intestino grosso de *Tatus novemcinctus* L., proveniente de Lassance, Estado de Minas Geraes (Brasil).

Denominamol-o de *Lauroia travassosi* n. g., n. sp., em homenagem ao nosso Mestre, Prof. Lauro Travassos.

Lauroia n. g.

Heterakinae. Corpo com cuticula estriada transversalmente. Extremidade cephalica com dilatação cuticular que forma 3 placas correspondentes aos labios. Azas lateraes presentes. Bocca com 3 labios. Vestibulo presente. Esophago com bulbo posterior. Papillas cervicaes ausentes. Annel nervoso ao nivel do fim do terço anterior do esophago e póro excretor ao nivel do meio do esophago. Femeas didelphas, amphidelphas, com vulva pouco saliente, situada no terço anterior do corpo. Oviparos. Ovos ellipsoides, regulares, não embryonados no utero. Cauda subulada. Machos sem azas caudaes e desprovidos de ventosa. Papillas caudaes presentes, em pequeno numero. Espiculos iguaes. Gubernaculo ausente. Parasitos de *Edentata.*

ESPECIE TYPO: — *Lauroia travassosi* n. sp.

Lauroia travassosi n. sp.

Comprimento: — Machos 7,5 a 7,8 mm.; femeas 8,3 a 8,8 mm.
Largura maxima: — Machos 0,3 a 0,4 mm.; femeas 0,3 a 0,5 mm.

Corpo com cuticula estriada transversalmente. Bocca com 3 labios bem desenvolvidos, sub-iguaes. Extremidade cephalica com dilatação cuticular formando 3 placas correspondentes aos labios. Para traz das placas se extendem 2 azas lateraes estreitas que terminam a 1,8 a 2,2 mm. da extremidade posterior em ambos os sexos. Esophago delgado, com 0,82 a 0,86 mm. de comprimento nos machos e 0,89 a 0,93 mm. nas femeas, por 0,024 a 0,028 mm. de largura naquelles e 0,024 a 0,026 mm. nestas. Apresenta em sua parte

anterior um vestibulo que mede 0,09 a 0,1 mm. de comprimento nos machos e 0,1 a 0,11 mm. nas femeas, e posteriormente um bulbo que mede 0,12 a 0,129 mm. de diametro nos machos e 0,13 a 0,14 mm. nas femeas. Póro excretor situado a 0,4 a 0,5 mm. da extremidade anterior em ambos os sexos, abaixo do annel nervoso, que fica distante delle de 0,12 a 0,14 mm. nos machos e 0,16 a 0,2 mm. nas femeas. Papillas cervicaes ausentes.

Femeas didelphas, amphidelphas, com vulva pouco saliente situada a 2,4 a 2,5 mm. da extremidade anterior. Vagina e ovejector sem nada de caracteristico. Ovos ellypticos regulares, não embryonados no utero, medindo 0,064 mm. de comprimento por 0,049 mm. de largura. Anus situado a 0,095 a 0,1 mm. da extremidade posterior, que é subulada.

Machos de cauda conica, afilando gradativamente e terminada por um curto appendice de 0,64 a 0,72 mm. de comprimento. Azas caudaes ausentes. Ventosa ausente. Espiculos iguaes, bem chitinisados, afilando gradativamente para a extremidade distal, terminados em ponta fina, e medindo 0,44 a 0,46 mm. de comprimento por 0,032 a 0,035 mm. de largura na base. Gubernaculo ausente. Sobre a face ventral se notam a abertura cloacal, situada a 0,14 a 0,15 mm. da extremidade posterior, e 5 pares de papillas, assim distribuidos: 1 par precloacal, sub-mediano; e 4 pares post-cloacaes, dos quaes 1 sub-mediano muito proximo da cloaca e ao lado de uma eminencia mediana existente logo após o orificio cloacal, 1 par sub-mediano para traz desta eminencia, e ainda, 2 pares marginaes muito posteriores, junto á origem do appendice caudal.

HABITAT: — Intestino grosso de *Dasypus sexcinctus* L. (hospedador typo) e *Tatus novemcinctus* L.

PROVENIENCIA: — Angra dos Reis, Estado do Rio e Lassance, Estado de Minas Geraes — Brasil.

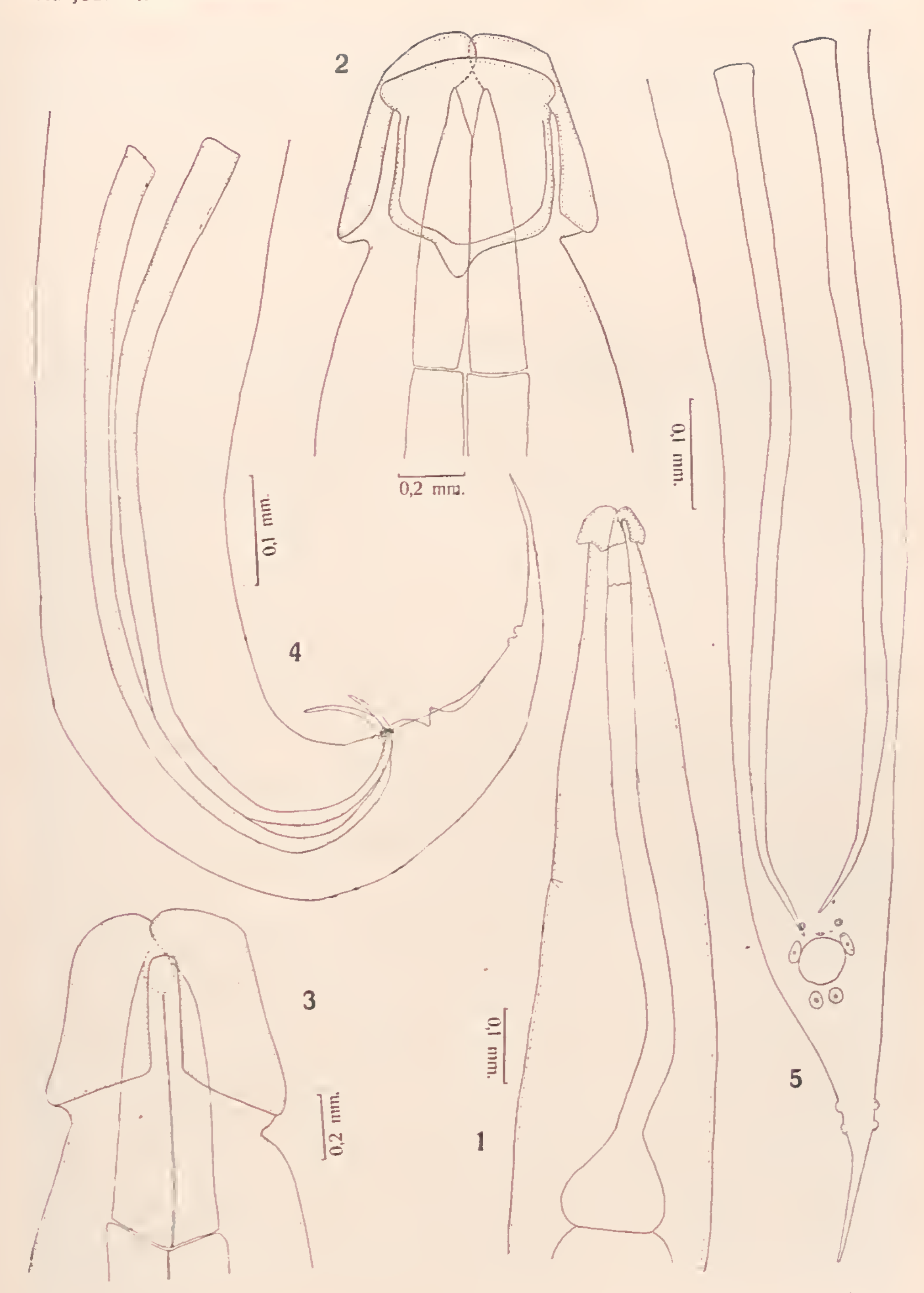
Typos e cotypos depositados na collecção helminthologica do Instituto Oswaldo Cruz.

Este novo genero se approxima de *Aspidodera* Railliet & Henry, 1912, do qual se differencia pelas formações cephalicas, pela situação mais anterior da vulva, pela ausencia de ventosa caudal nos machos e pela ausencia de gubernaculo.

Estampa 1

Lauroia travassosi n. g., n. sp.

Fig. 1 — Extremidade anterior, vista lateral.
Fig. 2 — Extremidade cephalica, vista dorsal.
Fig. 3 — Extremidade cephalica, vista ventral.
Fig. 4 — Extremidade posterior do macho, de perfil.
Fig. 5 — Extremidade posterior do macho, de face.



Proença: Novo typo de *Heterakinae*.

On Three Species of Filariid Nematodes from Sloths

J. H. Sandground

Museum of Comparative Zoology, Harvard University, Cambridge, Mass. — U. S. A.

[With 2 plates]

In the latter half of the last century when genera were endowed with the vaguest and broadest of definitions, several species of nematodes found in sloths were described under the titles: *Spiroptera* and *Filaria*. Some of these, parasites of the alimentary tract, have in more recent times been recognized as belonging to spiruroid genera such as *Physocephalus*. However, there have remained unallocated in the modern taxonomic system, two species which occurred in locations more peculiar to members of the family *Filariidae*. These parasites were collected in Brazil by the famous explorer-naturalist Natterer, and were described by Molin. The first of these, *Filaria incrassata* Molin, 1858 was described from two hosts: the coati, *Nasua socialis* and the three-toed sloth, *Bradypus tridactylus*. From a survey of the literature it appears that this species was not recorded again until a member of the Hamilton Rice Seventh Expedition to the Amazon found several female specimens of a filariid beneath the pleura of *B. tridactylus*. One of these female worms was sent by Strong (1926) to the late Doctor B. H. Ransom and was identified as *F. incrassata*. In view of absence of males in this material and the shortcomings of Molin's description which was not supplemented by any drawings, it is difficult to imagine on what criteria, other than the circumstances of its occurrence, the species could be so definitely identified.

A second species of Filariid, found on the digital tendons of *Choelopus* (formerly *Bradypus*) *didactylus* was described by Molin (1860) under the title *Spiroptera spiralis*. From the foot pads of *Bradypus cuculliger* (synonym of *B. tridactylus*) presumably the same *Spiroptera spiralis* was next recorded by v. Linstow (1879) who, with greater taxonomic insight, referred the species to the pseudogenus *Filaria* and who supplemented his brief description with a schematic drawing of the male tail. Molin's type specimens were apparently re-examined by v. Drasche (1883) and by Stossich (1898), but neither of these authors added anything significant to the previous descriptions. Stossich summarily transferred the species to the genus *Oxyspirura*. The nomenclatural vicissitudes of the species underwent one further change at the hands of Railliet & Henry (1910) who, in reviving Diesing's genus *Onchocerca*, suggested the inclusion of *F. spiralis* apparently without having examined actual specimens. Later Railliet (1916), without comment on the matter, included *F. spiralis* as a probable representative of the genus *Oxyspirura*. Consequently we find the species listed twice with a mark of interrogation under the genera *Oxyspirura* and *Onchocerca* in Yorke & Maplestone's monograph on « The Nematode Parasites of Vertebrates ».

Having devoted considerable attention to the taxonomic relations of the various species of *Onchocerca* and allied genera (Sandground 1931 and 1936), I have had a sustained interest in the status of the presumptive *O. spiralis*. Hence I feel greatly indebted to my colleague Doctor Joseph Bequaert who provided an opportunity of studying a series of excellently preserved filariids which he had collected from the subcutaneous tissues of *Choloepus didactylus*, the host having been taken in the Republic of Colombia (Locality: near Villavicencio, Department Meta). On examination, Dr. Bequaert's collection was found to be comprized of two species, easily distinguished by differences in the cuticular ornamentation and the general body proportions. Neither of these species could be identified with the specimen which had been identified in Ransom's laboratory as *F. incrassata*. Which of our species belonged to Molin's *O. spiralis*? As might be expected the original descriptions, couched in obsolete terms, were more confusing than helpful in answering this question, and it soon became evident that no reliable solution to the problem could be elicited without recourse to the types of Molin's species. Fortunately these are still preserved in the Naturhistorische Museum in Vienna and through the courtesy of the curator, Dr. Maximilian Holly, I was privileged to examine the type material of *Filaria incrassata* and *F. spiralis*.

From my study of specimens it is now certain that sloths are parasitized by at least three very distinct species of filariids, one of which I find to be new to science and all of which belong to different genera. Their descriptions follow: —

Dirofilaria incrassata (Molin, 1858) Mihi.

SYNONYM: *Filaria incrassata* Molin, 1858.
HOST: — *Bradypus tridactylus* (& ? *Nasua narica*).
LOCALITY: — Barra do Rio Negro (Manaos), Brazil.

The type specimens upon which this description is based consists of two males and several females, whose measurements (in millimeters) are tabulated below: —

	Male	*Female*
Length	35-43	90-110
Maximum width	0.22	0.43
Nerve ring from anterior end	0.23	0.24
Length of oesophagus	0.96	1.49
Length of tail	0.56	0.75
Length of left spicule	0.55	—
Length of right spicule	0.13	—
Vulva from anterior end	—	2.05

These are relatively narrow worms with cuticle apparently devoid of transverse striations even under high magnification. Characteristic of the genus, the head is without teeth, lips or other cuticular prominences; cephalic papillae and amphids are minute and barely perceptible. The female is viviparous. The vulva is situated some distance behind the simple oesophagus and is

difficult to locate because its position is not marked by a tumescence of its lips. In the male the caudal extremity (Pl. 2, fig. 1) is fairly straight. Caudal alae are well developed, being supported on each side by 6 preanal clavate papillae, 1 par-anal and 2 or 3 post-anal papillae. These papillae diminish in size from before backward. The spicules are poorly cuticularized and hence difficult to measure accurately unless the terminal flagellar portion of the left spicule is partially exserted.

« *Filaria* » *incrassata* is a typical member of the genus *Dirofilaria* as defined by Railliet & Henry. Although the pre-anal caudal papillae are often asymmetrically disposed and may vary in number from four to five pairs, *D. incrassata* appears to be the only species in the genus in which there are constantly six pairs of preanal papillae in addition to three posterior pairs.

Dipetalonema spiralis (Molin, 1860) Mihi.

SYNONYMS: — *Spiroptera spiralis* Molin, 1860; *Filaria spiralis* v. Linstow, 1879; *Filaria spiralis* v. Drasche, 1883; *Oxyspirura spiralis* Stossich, 1898; *Onchocerca spiralis* Railliet & Henry, 1910; *Oxyspirura spiralis* Railliet, 1916.

HOSTS: — *Choelopus didactylus* (Colombia) and *Bradypus tridactylus* (Brazil).

The following description is based on eleven female specimens from *Choelopus*: Length 34-46 mm. Width in mid-body averages 0.5 mm. Both anteriorly and posteriorly the body is sharply attenuated (Pl. 1, fig. 1). Cuticle thin and transparent, with fine transverse striation (see Pl. 1, fig. 2). In addition to the usual amphids, there are four pairs of cephalic papillae in the median-dorsal and median-ventral positions; of these the external ring of papillae project prominently. Mouth opening round, enclosed in a quadrilateral framework (Pl. 2, fig. 2). This frame is a subcuticular structure and is presumably to be homologized with the elevated cephalic shield which is more conspicuous in certain species of this genus than in others. A very shallow buccal cavity opens into a rather slender oesophagus, 1.05 to 1.2 mm. long and seemingly not differentiated into anterior and posterior portions. Nerve ring 0.24 mm. from anterior end. Cervical papillae not observed. The narrow intestine commences as a pyriform dilation and is swollen into a rectal chamber at the other extremity. Tail averages 0.27 mm. in length; at its bluntly rounded tip are a pair of minute sub-lateral papillae. The posteriorly directed vagina is muscular throughout its length (0.4 mm.) and presents a bulbous enlargement as it opens at the salient vulva which is located about 0.6 mm. from the head. Ovaries extend to within a short distance of the anus. Microfilaria without a sheath.

Of the original seventeen specimens (including one male) upon which Molin states that his description was based, the material conserved in the Naturhistorische Museum in Vienna now consists of only 15 female worms. These are identical with the specimens described above from *Choelopus*. In the absence of male specimens, the identification of the majority of Filariid genera is fraught with uncertainty. To some extent this uncertainty must apply also to the species under consideration. But, aside from commensural relationships, we find that in no features do the females here described depart from

the descriptions that have been presented for such species as *D. roemeri* (v. Linstow) or *D. spelaea* (Leidy). Because they show no character which is incompatible with their being assigned to the genus *Dipetalonema* I have made this provisional designation.



From Molin's brief account of *F. spiralis* in which a dense striation of the body is described, it would be thought that the description applied more appropriately to the next species which we are to consider than to *Dipetalonema spiralis* as identified by the type specimen. This is simply an illustration of the danger of interpreting some of the relative terms used in the older descriptions in establishing the status of parasitic nematodes. So far as we can tell the species now to be described has not previously been recorded*, and we take particular pleasure in naming it after is distinguished collector. To accommodate it in the modern taxonomic scheme, we find it necessary to create the new genus, *Bostrichodera*.

Bostrichodera bequaerti gen. et sp. nov.

Following are the principal dimensions of the organs in millimeters, based on the examination of 1 male and 19 female specimens:—

	Male	*Female*
Length	28—30	57—61
Maximum breadth	0.29—0.30	0.50—0.53
Oesophagus muscular part	0.56—0.61	0.65—0.75
Oesophagus glandular part	1.40—1.37	1.55—1.75
Length of tail	0.17—0.18	0.27—0.28
Spicule left	0.44—0.49	—
Spicule right	0.10—0.11	—
Vulva from anterior end	—	1.58—1.67

Description. — Filiform worms of relatively uniform width. There is a more marked attenuation of the body posteriorly than anteriorly. Cuticle fairly thick and as coarsely striated in the anterior and posterior parts of the body as in the middle. There is no evident difference in the cuticular ornamentation between the male and female. The broad striae take the form of bands, about 16 microns apart in the mid-body, and interrupted in the lateral fields so as to give a spiral appearance. This illusory appearance is produced by the deflection of the individual striae as they approach the lateral fields (Pl. 1, fig. 3). On examining the surface of the cuticle in certain regions of the body and more particularly in the male worms, one finds rows of lenticular elevations in the spaces between the striae (Pl. 2, fig. 1). These are only observed under the oil-immersion objectives. They are probably homologous with the rod-like cuticular thickenings described by Li (1933) in *Paronchocerca bambusicola* (Li) Peters, and appear to be of the same nature as the verrucous

* The sheathless *Microfilaria kerandeli* Brimont, 1909, from *Bradypus tridactylus* cannot as yet be correlated with the adult parent worm.

structures that ornament the caudal venter of the male in several genera of the *Spiruridae*, e. g. *Physaloptera*.

The anterior extremity is bluntly conical and is provided with four pairs of cephalic papillae which, together with the amphids, are arranged in a form identical with that of many other filariid genera such as *Dirofilaria*, *Hastospiculum*, *Onchocerca*, etc. Mouth, with circular, depressed rim, opens by way of a very shallow buccal vestibule into the well-developed muscular oesophagus. This anterior part of the oesophagus is encircled near its middle by the nerve ring and is much narrower than the opaque, glandular part of the oesophagus. A papilliform valve controls the opening into the lumen of the relatively thin walled, sinuous and narrow intestine. Internally, in the region immediately behind the head, on either side of the beginning of the oesophagus are two granular structures. These show very plainly in Pl. 1, fig. 3. Comparable structures are to be seen in many filariid species and are probably similar in nature to the bodies described as « pigmented spots in von Linstow's account of *Filaria spiralis*. I interpret these structures to be amphidial glands, for they are connected to the surface by fine ducts or nerve strands.

The body of the female commences to taper about 10 mm. in front of the anus. The tail (Pl. 2, fig. 5) is digitiform with very minute sublateral papillae (probably external phasmids near its tip. Vulva slightly salient, situated near the middle of the glandular oesophagus. There is a well-developed, muscular pars ejaculatrix at the proximal end of the vagina. Opisthodelphous. Viviparous; microfilaria, teased from the uteri measure in glycerine about 330 microns long and approximately 12 microns in greatest width, unsheathed, with truncated conoid head and subulate, ventrally flexed tail.

The body of the male is not as straigth as the female and the posterior part is tightly wound in a coil of two to four turns. Consequently, without cutting the specimen it is difficult to secure a good ventral view of the tail. Well developed caudal alae, about 40 microns wide at the anal level, extend from a level some 270 microns in front of the anus. Supporting the alae are four pairs of large claviform preanal papillae, equidistantly spaced and diminishing in size from in front backwards. Postanally there are four or five pairs of smaller papillae, arranged at decreasing intervals. In addition to the aforementioned, there are a number of minute sessile papillae near the midline. Of these, three are arranged on the anterior edge of the cloaca and there is a symmetrical pair just behind this opening. In general form (Pl. 2, fig. 5) the spicules resemble those of various species of *Onchocerca*, but the lines of heavy cuticularization are, I think, generically different. By reference to the more minute details of structure, I believe the spicules show features of good differential value, though these are difficult to express in words.

GENERIC RELATIONS

As a principle it is well recognized that the evolution of parasitism is accompanied by structural regression or a loss of differentiation. As a result, the relationship between diverse members of a group is often obscured and classification is rendered difficult. This particularly applies to the *Filaroidea* for which no system of classification thus far devised has proved adequate.

Special dissatisfaction has been directed against the use of cuticular ornamentation as a phylogenetically significant character. The subfamily *Loainae* Yorke & Maplestone, 1926, based upon such a cuticular character has been suppressed by all subsequent essayists, and only a few have not forthright rejected the group, *Onchocercinae Leiper*, 1911. Of the four genera that have been brought together in the latter subfamily, there is apparently sufficient evidence to support the contention that *Onchocerca* and *Elaeophora* are closely related, but it is doubtful whether any equally strong case could be made out for linking up with them the genera *Onchocercella* and *Paronchocerca*. Although it is convenient for the present to associate these four genera, it must be recognized that they have no precise common denominator and that the subfamily is, in all probability, artificial.

The coarse striation of the cuticle is a striking feature of the species described above and an affinity with *Onchocerca* is immediately suggested thereby. If the purpose of assigning a generic title were simply to facilitate subsequent identification, the species *bequaerti* could be included in *Onchocerca* by broadening the generic definition along the lines suggested by Wehr & Dikmans (1935). But, aside from the emendation that these authors have submitted being inaccurate in one or two particulars, its acceptance would threaten the integrity of several well established genera in the family, and for this we have no warrant at present. « *Onchocerca* » *cervipedis*, of which I have examined several specimens, is admittedly very similar to *O. gutturosa* Neumann from which it differs mainly in having a finely and uniformly striated cuticle. But the impasse created by including it in the genus is such that the authors would, in my opinion, have better served the goal of taxonomy had they erected a subgenus, or made some other nomenclatural disposition of their species.

Although we cannot avoid reference to the peculiar annulations of the cuticle as the outstanding character of species of *Onchocerca*, it does not necessarily follow that the character is generically restricted. In fact a comparable ornamentation of the cuticle in such unrelated species as *Hastospiculum onchocercum* Chitwood, 1932, and the incompletely described « *Filaria* » *cingula* v. Linstow, 1902 (cf. Krecker, 1916) indicates that it is an adaptive feature, sometimes of no more than specific significance.

It thus becomes apparent that a modified type of cuticular annulation can only serve for the recognition of a species of *Onchocerca* providing it is coupled with other compatible characters. Failing to appreciate this, Li (1933) described an avian parasite, *O. bambusicola* which Peters (1936) transferred to the new genus *Paronchocerca*. If, now, we should assign the species *bequaerti* to *Onchocerca*, we should again be disrupting the natural homogeneity of a genus whose accepted species are so similar in appearance that, for the most part, they can only be separated on commensural data. The species *bequaerti* differs conspicuously from all of these in special particuliarities of the annulation, a lesser disparity between the size of the two sexes, the proportions of its various organs, and the highly developed caudal alae and papillae in the male. In consequence of these and other differences, I propose a new genus, *Bostrichodera*, which, being monotypic, is provisionally defined in the following terms: *Relatively robust filariids, with thick, coarsely annulated cuticle in both sexes. Females not more than three or four times the length of the male. Eight cephalic papillae arranged in two rings. Oesophagus of substantial build,*

conspicuously divided into a narrow muscular and wider glandular portions. Male with well developed caudal alae and four pairs of large claviform preanal papillae. Spicules dissimilar and unequal.

TYPE SPECIES: — *Bostrichodera bequaerti.*

TYPE HOST AND LOCALITY. *Choelopus didactylus* (Linn.); Dept. Meta, Colombia.

TYPE SPECIMENS: — N.º 671 Helminthological Coll. Mus. Comp. Zool., Harvard University.

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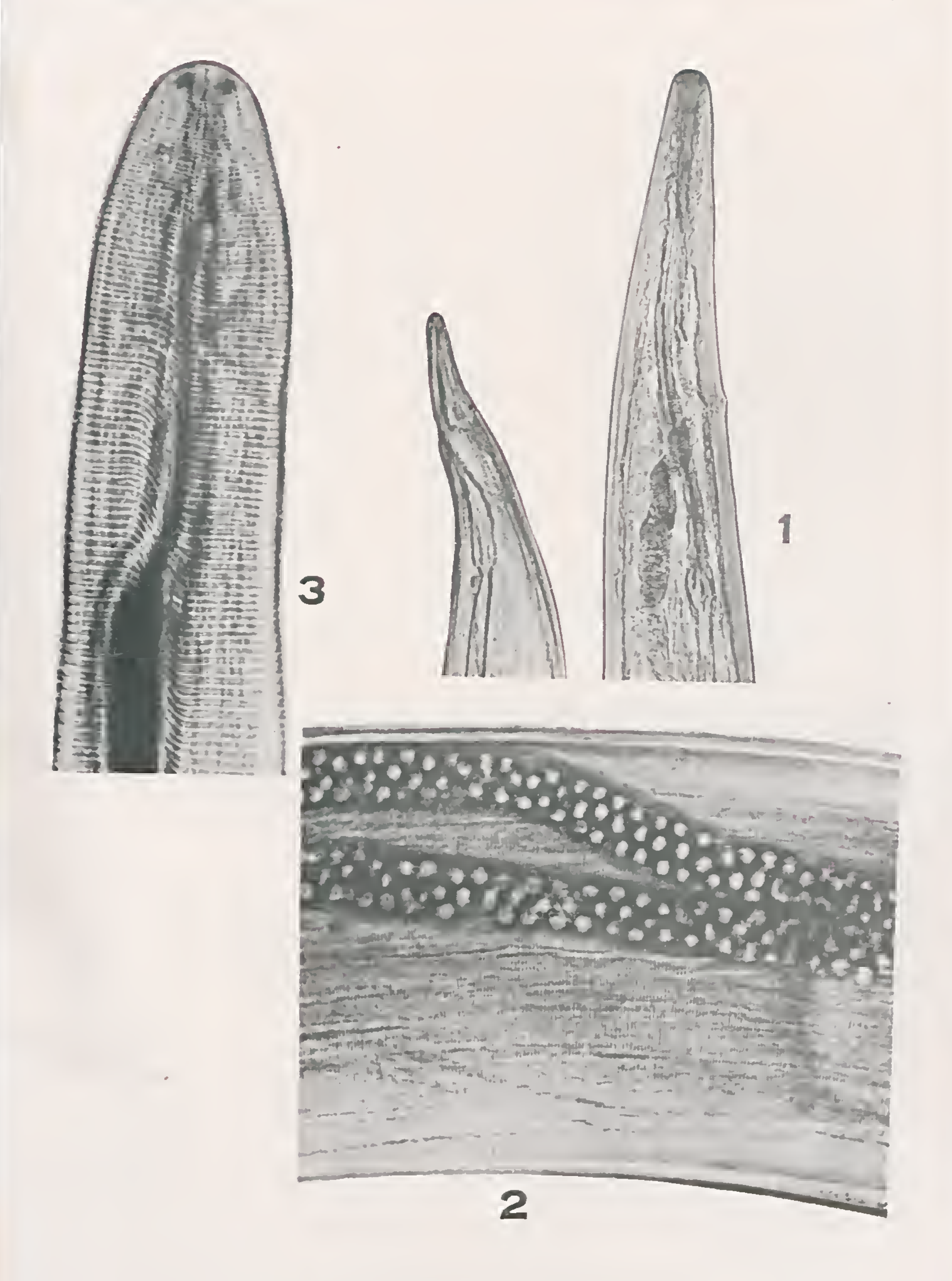
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Plate 1

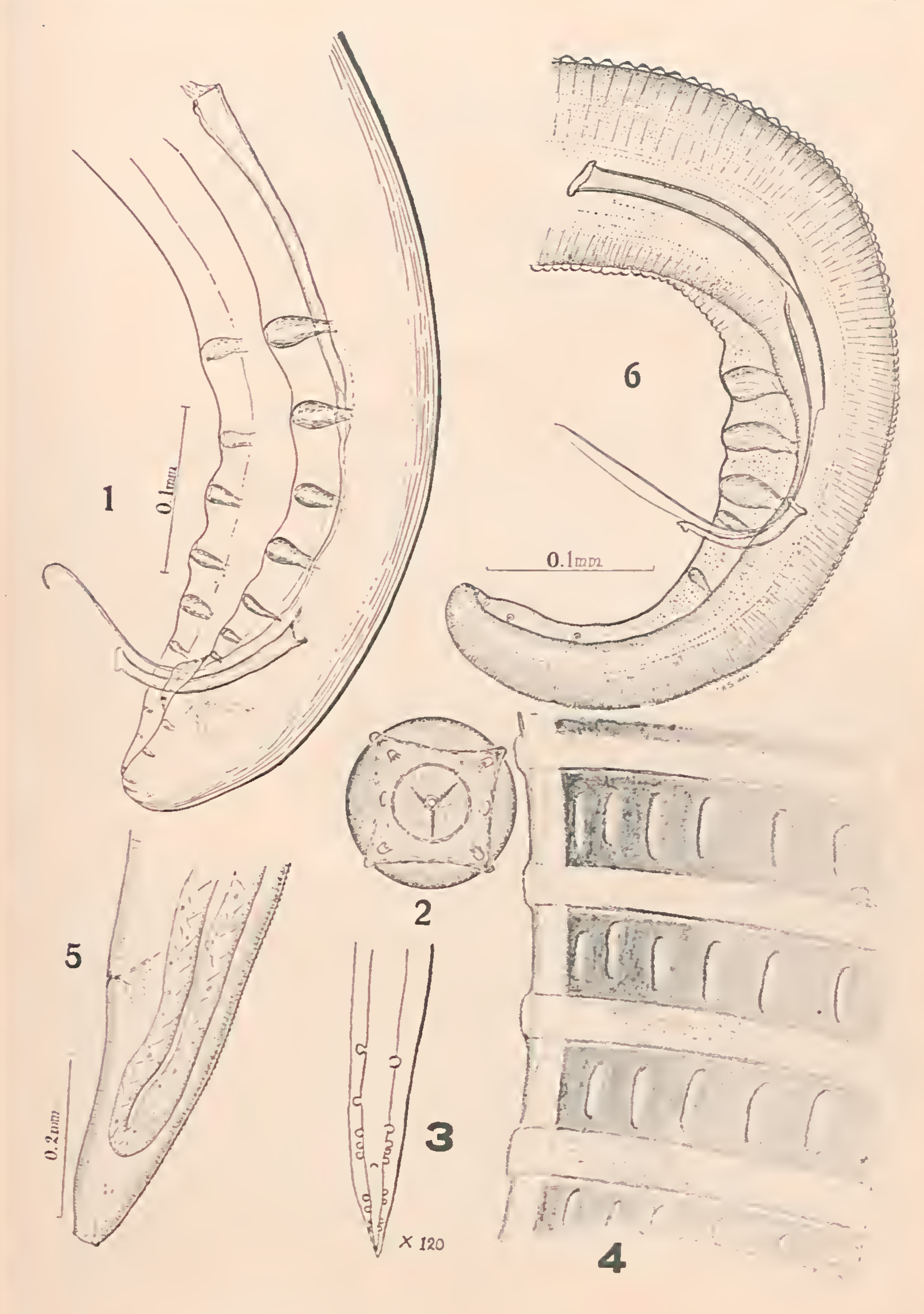
Fig. 1 — *Dipetalonema spiralis.* Anterior and posterior extremities of the female.
Fig. 2 — *Dipetalonema spiralis.* Striation of the cuticle.
Fig. 3 — *Bostrichodera bequaerti.* Anterior extremity of male to show pattern of cuticular striation.



Sandground: Filariid Nematodes from Sloths.

Plate 2

Fig. 1 — *Dirofilaria incrassata*. Tail of male.
Fig. 2 — *Dipetalonema spiralis*. Frontal view of head.
Fig. 3 — « *Spiroptera spiralis* Molin. Tail of male — after v. Drasche (1883).
Fig. 4 — *Bostrichodera bequaerti*. Detail of cuticular verrugae under very high magnification.
Fig. 5 — *Bostrichodera bequaerti*. Tail of female.
Fig. 6 — *Bostrichodera bequaerti*. Tail of male.



Sandground: Filariid Nematodes from Sloths.

The localization of swine lungworm larvae in the earthworm, Helodrilus foetidus

Benjamin Schwartz and **Dale A. Porter**

Chief and Junior Parasitologist, Zoological Division, Bureau of Animai Industry, United States Department of Agriculture, Washington, D. C. — U. S. A.

[With 5 figures]

INTRODUCTION

The object of the investigation that is recorded in this paper was to secure precise information on the localization in the intermediate annelid host of the larvae of lungworms of the genera *Metastrongylus* and *Choerostrongylus* that are parasitic in domestic swine. The data presented in this paper supplement those given by Schwartz & Alicata (1934) and contain information and discussions not available in previous publications on the life history of swine lungworms.

In the United States swine are commonly infested with lungworms of the species *Metastrongylus elongatus* and *Choerostrongylus pudendotectus*, these parasites occurring usually in the lungs of the same host animal, the former species being more numerous than the latter, as a rule. While *M. salmi* is known to occur in swine in this country, it is encountered only occasionally, and comparatively few specimens are found in individual hogs. So far as can be judged from previous work (Schwartz & Alicata, 1934) the larvae referred to in this paper were probably a mixture of the 2 common species mentioned.

MATERIALS AND METHODS

The earthworms used for examination and for sectioning were collected at the former Experiment Station of the Bureau of Animal Industry at Bethesda, Maryland, and in lots and pastures at Leonardtown, Maryland, during the years 1935 and 1936. For direct examination to determine the incidence and localization of lungworm larvae, the earthworms were washed in cold water, and placed later in a large petri dish containing 20 percent alcohol; when they no longer responded to external stimuli, each earthworm was pinned to a paraffin dissection tray and an incision was made along the mid-dorsal body wall with a pair of fine scissors. The digestive tract, together with the adhering parts of the circulatory system, including the dorsal and ventral blood vessels, and the « hearts », were carefully removed. The parts so removed were placed on a glass slide and pressed gently with cover slips, so that the larvae present could be seen and counted readily under a dissecting binocular microscope.

Experimental infections of earthworms with lungworm larvae were carried out as follows: Earthworms obtained from horse manure at Bethesda, Md., were placed in loosely covered, large petri dishes containing moist shreds of

filter paper to which were added large numbers of eggs, obtained by cutting up gravid female specimens; the eggs were ingested by the earthworms with the filter paper.

To prepare earthworms for sectioning, they were kept in various glass containers with moist filter paper that was changed daily, the containers being cleaned before the fresh filter paper was added. After it was determined that the digestive tracts of earthworms were freed from the last traces of soil, as evidenced by the presence in the containers of filter paper excreta only, each earthworm to be sectioned was placed in a small, flat-bottomed glass dish containing just enough water to cover the specimen. To the water in the dish there was added at frequent intervals one drop of alcohol at a time, until a concentration of 10 per cent alcohol was obtained. The earthworms were left in this solution until they no longer responded to external stimuli. Zenker's fluid was used as a fixative and the sections, 8 to 10 micra thick, were stained with hematoxylin-eosin.

INCIDENCE AND LOCALIZATION OF SWINE LUNGWORM LARVAE IN *HELODRILUS FOETIDUS*

Although swine lungworm larvae are capable of living in various species of terrestrial earthworms of the families *Lumbricidae* and *Megascolecidae*, the species *Helodrilus foetidus* appears to be the most suitable intermediate host. This earthworm occurs in manure and compost heaps, its habitat and feeding habits exposing it to infection with lungworm larvae. A careful dissection of 63 individuals of this species has revealed, as shown in table 1, a 100 percent incidence of infestation, the abundance of larvae in individual earthworms varying considerably.

Earthworm specimens 1 to 31, inclusive, collected at Bethesda, Md., showed a range of 1 to 124 larvae per earthworm, with an average 29.45 larvae per individual annelid. The area from which these 31 annelids were collected was occupied at one time or another by hogs and was so located that it drained other areas that were occupied by hogs from time to time. Specimens 32 to 37 harbored from 1 to 7 larvae, with an average of 3.33 larvae per earthworm. The area in Leonardtown, Md., from which these specimens were collected was not known to have been occupied by hogs. The remaining specimens, 38 to 63, consisted of 2 separate collections made in Leonardtown, Md., in November, 1935, and June, 1936. Of the larvae found in the 26 earthworms of these groups, accurate counts were made on those present in 16 specimens, and rather close estimates were made on the larvae found in the remaining 10 annelids, the estimates being based on counts of a major portion of the larvae and, in some cases, on counts of nearly all of them. The range for this group is from 1 to about 350 larvae per earthworm, the average number being about 161 larvae per annelid. The 26 earthworms showing this high intensity of infestation were collected from lots occupied by hogs and, hence, contaminated water with their feces.

It is evident from the data on the incidence of lungworm larvae in earthworms, that areas occupied by infested hogs contained a large percentage of rather heavily infested earthworms; the earthworms in areas occupied by

swine at one time or another, and receiving drainage from other areas occupied by swine, contained moderate infestations with lungworm larvae. The presence of but few larvae in earthworms collected on a lot or pasture is evidence that the area was occupied by swine harboring but slight infestations or, if swine were not known to have been kept there, that the infestations in the earthworms resulted from contamination due to drainage from infested areas or other causes. The migration of earthworms from infested to non-infested areas should also be kept in mind as a possibility. The extent to which such migration is possible has not been determined by the writers by experimentation or by a study of the literature. The complete absence of lungworm larvae in *H. foetidus* would be conclusive evidence, however, that these annelids did not ingest swine manure or, if they did ingest such manure, the latter must have been eliminated from non-infested swine. However, considering the prevalence of lungworms in swine in practically all parts of the United States where these host animals are raised, it is safe to conclude that the absence of lungworm larvae in suitable intermediate earthworm hosts, particularly *H. foetidus* and closely related species, is good evidence that the annelids came from an area free from contamination with swine manure.

An examination of the data in table 1, with reference to the distribution of the larvae in the various locations listed, shows that out of an approximate total of 5,142 larvae found in the 63 earthworms, 4.819 or 93.73 percent were localized in the calciferous glands, the remaining larvae being distributed in the wall of the esophagus anterior to these glands, the « hearts », crop, intestine, dorsal blood vessel, ventral blood vessel and gizzard, in the order named. It is probable that had all of the earthworms been examined to determine the presence of larvae in the intestine, the total number found would have been larger than shown in the table; the total number found in the intestines of 32 earthworms was 41 or 1.28 larvae per earthworm, the actual range being from 1 to 6 larvae per individual. Only 13 of the 32 earthworms showed larvae in the intestine, the percentage of infestation being approximately 40 percent. Thirty-five earthworms (56 percent) contained larvae in the wall of the esophagus anterior to the calciferous glands (figure 1), the total number of larvae found in this location being 139, or an average of 2.2 larvae per individual annelid, with a range of 1 to 16 larvae for infested specimens.

Larvae were found in the « hearts » of 20 earthworms (figure 2), the percentage of infestation being slightly in excess of 31. It will be noted by reference to table 1 that larvae were not found in hearts where the total infestation of the individual earthworms was low; a total of 50 larvae for an individual was the lowest infestation involving the « hearts »; the range in the number of larvae found in individual annelids was from 1 to 9. Only 8 earthworms (about 11 percent) contained larvae in the two main longitudinal blood vessels, 7 of these annelids showing from 1 to 4 larvae in the dorsal blood vessel and 1 containing 3 larvae in the ventral blood vessel.

Twenty-two earthworms (about 35 percent) harbored larvae in the crop (figure 3), the range in number per individual earthworm being from 1 to 5. Only one earthworm contained a single larva in the gizzard.

It is significant that nearly 94 percent of the larvae were localized in the calciferous glands. Evidently, this is their preferred location, presumably because the larvae find in these organs optimum conditions for life. As will

be shown in the text which follows, the larvae occur in the blood sinuses, this showing that lungworm larvae in annelids inhabit the blood system, with a marked preference for the blood sinuses of the calciferous glands. That lungworm larvae are localized in the blood system of earthworms was noted by von Schuckmann and Zunker (1930) who also described, but did not figure, the location of the larvae in the lamellar sinuses of the calciferous glands.

For a concise understanding of the localization of lungworm larvae in

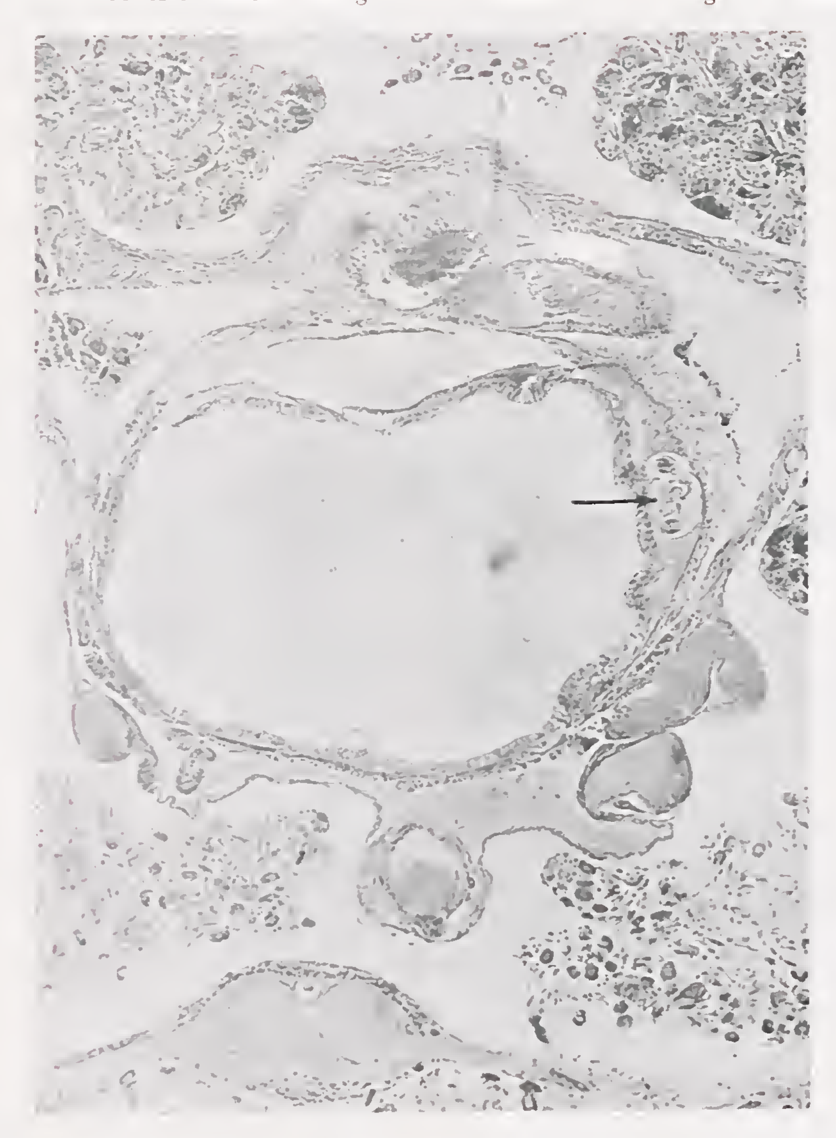


Fig. 1 — Cross section of *H. foetidus* in esophageal region anterior to calciferous glands. Note sections of larvae in blood sinus between muscular epithelial layers of esophagus.

the calciferous glands, the following brief review of the morphology of these glands is essential.

In annelids of the family *Lumbricidae* the wall of the esophagus just

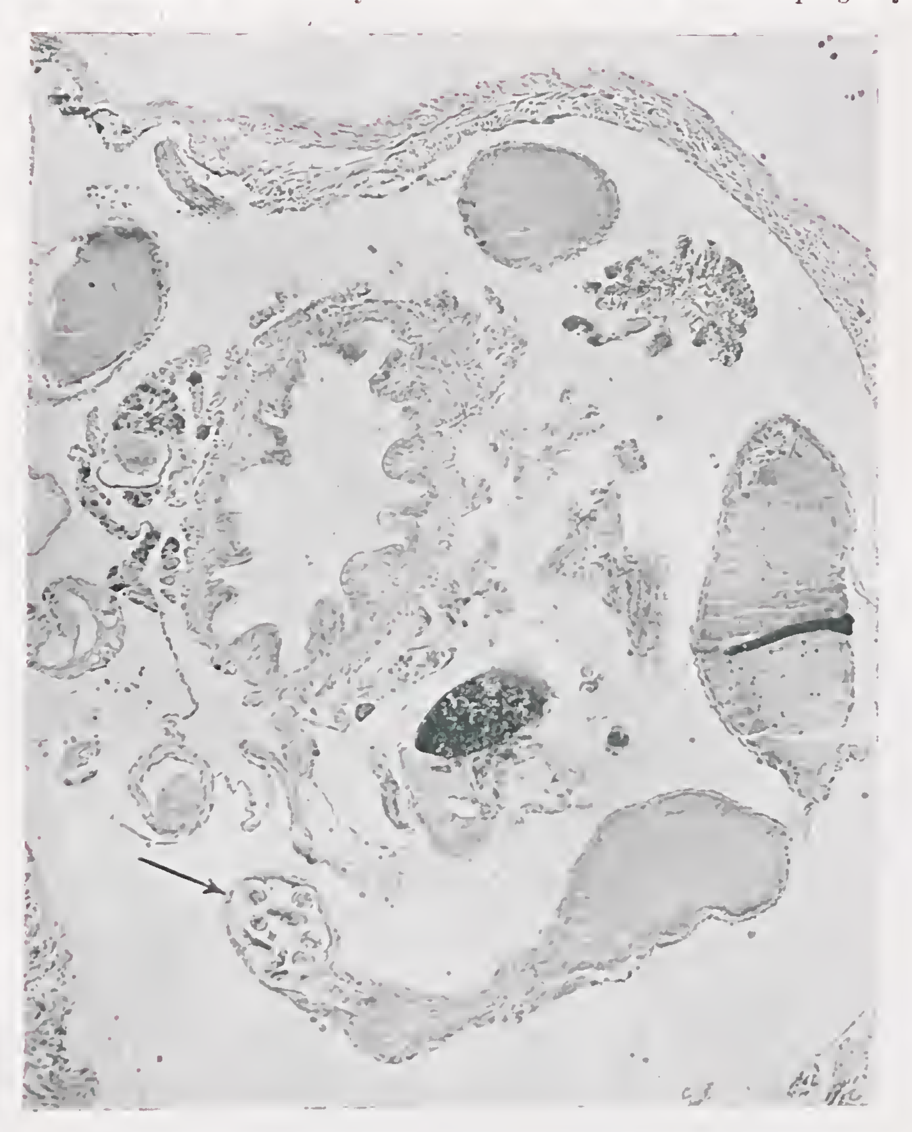


Fig. 2 — Cross section of *H. foetidus* in region of « hearts ». Note sections of larvae in one « heart », (possibly dorsal blood vessel).

anterior to the crop (somites 10 to 11) is characterized by a glandular development. According to Smith (1921) who investigated the calciferous glands in several species of the genus *Helodrilus*, including *H. foetidus*, there are no paired lateral evaginations in somite 10 in the species that he investigated, the

anterior part of the gland in *H. foetidus* being in somite 11; the chambers are relatively narrow in somite 11, and much wider in somite 12, posterior to which they become narrow again. Actually the calciferous glands in the *Lumbricidae* are dilatations of the walls of the esophagus in the posterior 5 segments (the

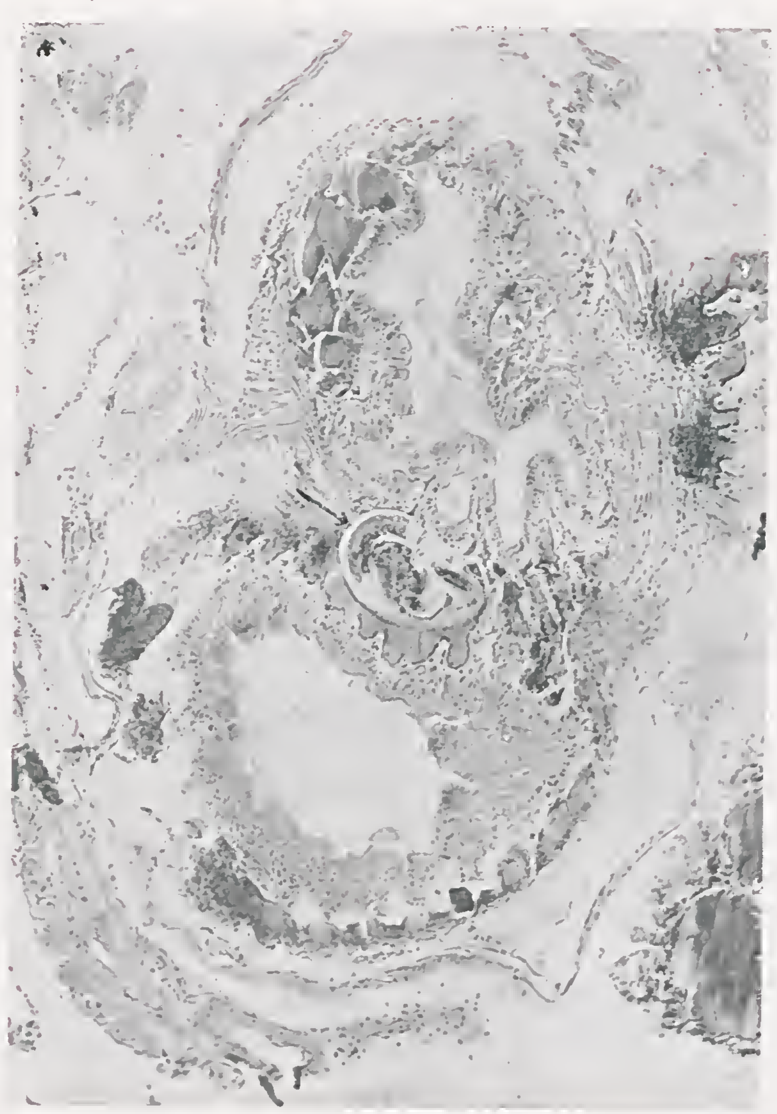


Fig. 3 — Cross section of crop (possibly esophagus just anterior to crop) of *H. foetidus*. Note sections of larvae in large blood sinus.

posterior 4 in *H. foetidus*), with the following structures, as seen in cross section.

The esophageal epithelium is thrown into a number of prominent ridges

or longitudinal lamellae; neighbouring lamellae unite at their free edges, and in this manner a series of longitudinal tunnels is established, the central lumen of each lamella being diminished. Each lamella consists, therefore, of a double



Fig. 4 — Cross section of calciferous glands of *H. foetidus*. Note invasion of lamellar sinuses by larvae on left side.

layer of esophageal epithelium, its narrowed lumen being invaded by a blood sinus. As a result of the fusion of neighbouring lamellae at their free ends, as already noted, the epithelium of the latter becomes separated from that of the esophagus.

The details of the structure of the calciferous glands in *H. foetidus* is shown in figures 4 and 5, photographs of transverse sections through these glands. In figure 4, the portion of the wall not invaded by lungworm larvae



Fig. 5 — Cross section of calciferous glands of *H. foetidus*. Note invasion of lamellar sinuses by larvae; the clear areas between the lamellae are the tunnels.

(right portion) shows (1) the lamellae as double walls of epithelium with a narrow lumen between the walls, (2) the coalescence of adjoining lamellae, and

(3) the tunnels between them; the wall on the left shows a heavy infestation with lungworm larvae, the latter being located in the blood sinuses that have invaded the lamellae. It is important to note that the invaded portion of the gland is greatly swollen, due to the penetration of the larvae and the consequent widening of intra-lamellar chambers in which the blood sinuses have become conspicuous. It is important to note also that larvae are not present in the tunnels, but are confined entirely to the blood sinuses. Figure 5, is a cross section of the calciferous glands of another earthworm, the magnification being much larger than that in figure 4. An inspection of figure 5 shows that nearly all of the lamella are invaded by larvae, the latter pushing the lamellar walls apart in the regions in which they lie; the clear areas between the lamellae are the tunnels which are not invaded by larvae.

EXPERIMENTAL INFECTION OF EARTHWORMS WITH *METASTRONGYLUS ELONGATUS*

On September 2, 1935, five specimens of *H. foetidus* were exposed to infection with *M. elongatus*. The lot of earthworms from which the 5 specimens were taken had been collected on August 3, 1935, in a pile of horse manure at Bethesda, Md. About 24 hours after exposure to infection, one eathworm was killed, fixed and sectioned; no larvae were found. Approximately 48 hours after exposure one of 2 earthworms was found to be infected with first-stage larvae, the latter being localized in the lamellar sinuses of the calciferous glands, as determined by a study of microscopic sections; the other earthworm was negative. About 72 hours after exposure to infection, one of the remaining earthworms was free from infection, and the other showed in microscopic sections numerous first-stage larvae in the blood sinuses of the wall of the esophagus anterior to the calciferous glands, in the lamellar sinuses of these glands, and in the blood sinuses of the crop. Six control earthworms from the same lot were examined for larvae with negative results.

It is evident from the observations that the preinfective larvae occur in the same locations in which the infective larvae are found. The entire development of swine lungworm larvae in the intermediate host takes place in the blood, the larvae remaining there until they reach the definitive host or die and undergo degenerative changes.

ENCYSTMENT AND DEATH OF LARVAE

In January, 1936, 2 earthworms, *H. foetidus*, that acquired a natural infestation with lungworm larvae were observed to contain encysted larvae. One of these earthworms, collected on August 3, 1935, and kept in the laboratory for 163 days, contained 2 fibrous cysts in the wall of the esophagus slightly posterior to the calciferous glands; a lungworm larva was present in each cyst. The second earthworm, *H. caliginosus* var. *trapezoides*, that had been kept in the laboratory for 56 days, contained 2 cysts, each containing a dead and disintegrating third-stage larva. In section, the larvae were found to be encapsulated in dense fibrous cysts located in the wall of the esophagus.

GENERAL DISCUSSION

It is evident from the data and illustrations that the larvae of swine lungworms are localized in the blood system of the earthworm intermediate host, the majority of the larvae occurring outside of blood vessels; the larvae occurring in the wall of the digestive tract, including the portion of the esophagus occupied by the calciferous glands, are situated in blood sinuses. The vascular layer of the wall of the alimentary canal of annelids is located between the epithelial and muscular coats (fig. 2) and consists of a network of sinuses, rarely continuous all around the gut, according to Stephenson and Prashad (1919).

The preferred localization of lungworm larvae in the calciferous glands is probably intimately related to the functions of these glands, the latter subject having aroused much speculation and considerable experimentation by zoologists. As their name suggests, the calciferous glands elaborate lime crystals, the granules of the calcium carbonate being liberated, presumably as a result of the degeneration of the cytoplasm of the secreting cells. It has been suggested that the calcium carbonate of earthworms serves to neutralize excess acid, due to the ingestion of humus. Other investigators have ascribed to the calciferous glands a respiratory function, and some have thought that their main function is the abstraction of CO_2 from the blood. One investigator ascribed to the calciferous glands a digestive function, and regarded the excretion of lime as of secondary importance.

Calciferous glands are known to occur only in terrestrial annelids, which live for the most part in an almost anoxybiotic environment. Recent investigations on the functions of these glands stress the fact that the secretion of $CaCO_3$ serves to fix the CO_2, which is converted into $Ca(HCO_3)_2$, thus protecting the worms in their burrows from an excess of CO_2. In a recent paper,

mechanism, and that the $\frac{CO_2}{\text{bicarbonate system}}$ in earthworms plays an important role in the physiology of animals that lack a respiratory regulating mechanism, and that the CO_2-bicarbonate system in earthworm plays an important part in the total buffering action. In the light of this view, the lime elaborated by the calciferous glands is a buffering reserve that is mobilized under unfavorable conditions, the regulatory action consisting of bringing $Ca(HCO_3)_2$ into the blood where it raises the bicarbonate concentration.

Adult lungworms are known to be strictly oxybiotic nematodes, and from the previous discussion it must be assumed that the larvae in the earthworm intermediate host are equally attuned to an environment in which CO_2 does not accumulate to excess. In the light of the foregoing discussion, it may be assumed that the preferred localization of lungworm larvae in the calciferous glands is probably associated with the sensitiveness of these nematodes to an excess of CO_2, their location in the lamellar sinuses of the calciferous glands placing them in a situation most favorable to their physiological requirements.

Table 1

Distribution of swine lungworm larvae in one of its intermediate hosts, *Helodrilus foetidus.*

Earthworm number	Total number of larvae found	Esophagus anterior to calciferous glands	Calciferous glands	Hearts	Dorsal blood vessel	Crop	Gizzard	Intestine
1	1	0	1	0	0	0	0	not examined
2	2	0	2	0	0	0	0	do
3	2	0	2	0	0	0	0	do
4	1	0	1	0	0	0	0	do
5	12	2	10	0	0	0	0	do
6	5	0	5	0	0	0	0	do
7	11	2	11	0	0	1	0	do
8	93	3	87	2	0	1	0	do
9	2	0	2	0	0	0	0	do
10	59	8	51	0	0	0	0	do
11	2	0	2	0	0	0	0	do
12	42	6	32	0	0	1	0	do
13	63	2	58	0	0	3	0	do
14	35	4	28	0	0	3	0	do
15	26	0	26	0	0	0	0	do
16	57	4	53	0	0	0	0	do
17	75	3	69	3	0	0	0	do
18	3	0	3	0	0	0	0	do
19	7	4	3	0	0	0	0	do
20	19	0	18	0	0	1	0	do
21	5	0	5	0	0	0	0	do
22	22	2	19	0	1	0	0	do
23	30	4	26	0	0	0	0	do
24	50	3	44	2	0	1	0	do
25	4	0	4	0	0	0	0	do
26	5	0	5	0	0	0	0	do
27	81	1	71	9	0	0	0	do
28	6	0	6	0	0	0	0	do
29	6	0	6	0	0	0	0	do
30	73	2	70	1	0	0	0	do
31	125	2	118	2	0	3	0	do
32	3	0	3	0	0	0	0	0
33	3	0	3	0	0	0	0	0
34	1	0	1	0	0	0	0	0
35	7	0	7	0	0	0	0	0
36	6	0	6	0	0	0	0	0
37	2	0	2	0	0	0	0	0
38	1	0	1	0	0	0	0	0
39	76	2	68	3	0	0	0	3
40	7	0	7	0	0	0	0	0
41	250 *	0	241	6	1	0	0	2
42	199	0	191	3	2	0	0	0
43	96	2	77	7	0	4	0	6
44	250 *	16	224	5	2	2	1	0
45	250 *	7	236	0	3	0	0	4
46	61	0	60	2	0	0	0	2
47	115	2	108	0	0	2	0	3
48	75	0	74	0	0	0	0	1
49	250 *	0	245	3	0	1	0	1
50	114	7	105	0	0	2	0	0
51	87	3	84	0	0	0	0	0
52	350 *	15	332	0	3 **	0	0	0
53	250 *	5	230	8	0	3	0	4
54	111	1	108	1	0	1	0	0
55	150 *	3	143	0	0	0	0	4
56	300 *	5	288	3	4	0	0	0
57	167	2	158	4	0	3	0	0
58	250 *	1	240	0	2	2	0	2
59	150	0	143	4	0	1	0	2
60	250 *	2	236	6	0	2	0	4
61	53	3	49	0	0	1	0	0
62	75	2	68	0	0	5	0	0
63	250 *	3	240	2	0	2	0	3

* The total number of larvae are estimated; the number recorded from various organs, except the calciferous glands, are based on actual counts.

** The 3 larvae were found in the ventral blood vessel.

SUMMARY

Swine lungworm larvae were found to be present in each of 63 specimens of the earthworm, *Helodrilus foetidus*, collected in various areas, the abundance of larvae in individual earthworms being greater, as a rule, in specimens obtained from areas contaminated with the feces of swine than in those obtained from areas not known to have been so contaminated.

Approximately 94 percent of the larvae recovered from the 63 earthworms were located in the calciferous glands; other locations were the wall of the esophagus anterior to the calciferous glands, the « hearts », crop, intestine, dorsal blood vessel, ventral blood vessel and gizzard, in the order named.

Larvae occurring outside of blood vessels are located in blood sinuses, the larvae in the calciferous glands being localized in the lamellar sinuses.

Experimental infection of *H. foetidus* with *Metastrongylus elongatus* resulted in the localization of most of the preinfective larvae in the lamellar sinuses of the calciferous glands in 48 and 72 hours after the earthworms were exposed to infection, showing that the preinfective larvae occur in the same locations that are occupied by the infective larvae.

The ultimate fate of larvae that do not reach the definitive swine host is apparently encapsulation in fibrous cysts, followed by death and subsequent desintegration of the larvae within the cysts.

It is suggested that the marked affinity of the larvae for the calciferous glands is probably related to the functions of these organs; recent investigations have shown that the lime elaborated by the glands fixes CO_2 and that the resulting compound, $Ca(HCO_3)_2$ regulates the bicarbonate concentration of the earthworms' blood: the lime elaborated by the calciferous glands constitutes a buffering reserve.

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Primo contributo alla conoscenza dei Protura (Insecta) del Brasile e di Costa Rica

F. Silvestri
R. Laboratorio di Entomologia Agraria, Portici — Italia

[Con 2 figure nel testo]

L'ordine dei *Protura*, da me fondato nel 1907 sopra una specie (*Acerentomon Doderoi* Silv.) trovato in Italia, conta ormai alcuni generi e buon numero di specie raccolte in quasi tutte le regioni temperate e tropicali della Terra, ma fino ad oggi non ne annovera dell'America meridionale.

Io ho il piacere di descrivere la prima specie del Brasile e di dedicarla al Collega Dr. Prof. L. Travassos in segno di stima e di amicizia. Oltre la specie di *Acerentulus* qui descritta, io ho anche esemplari del genere *Eosentomon* Berl. del Brasile (2 di Cuyabá, 1 di Campinas e 1 giovane di Pernambuco), ma non ho potuto per lo stato di detto materiale esaminarne bene tutti i caratteri; perciò non ho potuto determinarne la specie. Altre accurate ricerche in differenti ambienti potranno farne scoprire certamente altre specie.

Colgo l'occasione per aggiungere in questa nota anche la descrizione di una specie di *Acerentulus* dell'America centrale (Costa Rica).

Acerentulus travassosi sp. n.

(Fig. 1).

Femina. — Corpus ferrugineum corporis parte antica paullum pallidiore.

Caput fere 1/3 longius quam latius, pseudocellis bene evolutis, setis superis posticis 3 + 3, quam seriei longitudinalis submedianae 5 + 5 parum brevioribus, setis tribus brevioribus sublateralibus et 2-3 etiam brevioribus lateralibus, facie infera setis 5 + 5 brevibus.

Palpi maxillares rostri apicem haud superantes, 3-articulati, articulo ultimo cylindrico quam penultimus angustiore; palpi labiales tuberculiformes.

Thorax. Pronotum setis 1 + 1 sublateralibus brevibus et 1 + 1 sublateralibus brevioribus; mesonotum cercine chitineo antico quam metanoti minus lato, setis utrimque 10 instructum, quarum subanticae 5, 2 transverse submedianae et posticae 3 dispositione et longitudine ut in metanoto (Fig. 1, 3).

Sterna: prosternum setis utrimque 6, quam duae anticae brevissimae, duae submedianae breves et duae posticae sublateralis et lateralis breves; meso- et metasternum seta mediana subantica et setis utrimque 5 brevioribus instructa.

Pedes primi paris tarso setis parce numerosis longis subtilibus, distalibus quam articuli longitudo tota c. dimidio brevioribus, sensillo dorsuali proximali clavato breviore et sensillo distali lanceolato parum breviore instructo, seta apicali dorsuali quam ceterae parum crassiore et parum breviore; seta apicali ventrali minima; ungue praetarsali quam tarsus 3/4 breviore. Pedes

secundi et tertii paris tarso setis 8-9 brevibus instructo, praetarso seta infera quam unguis dimidia longitudo superante, aciculis proximalibus brevissimis.

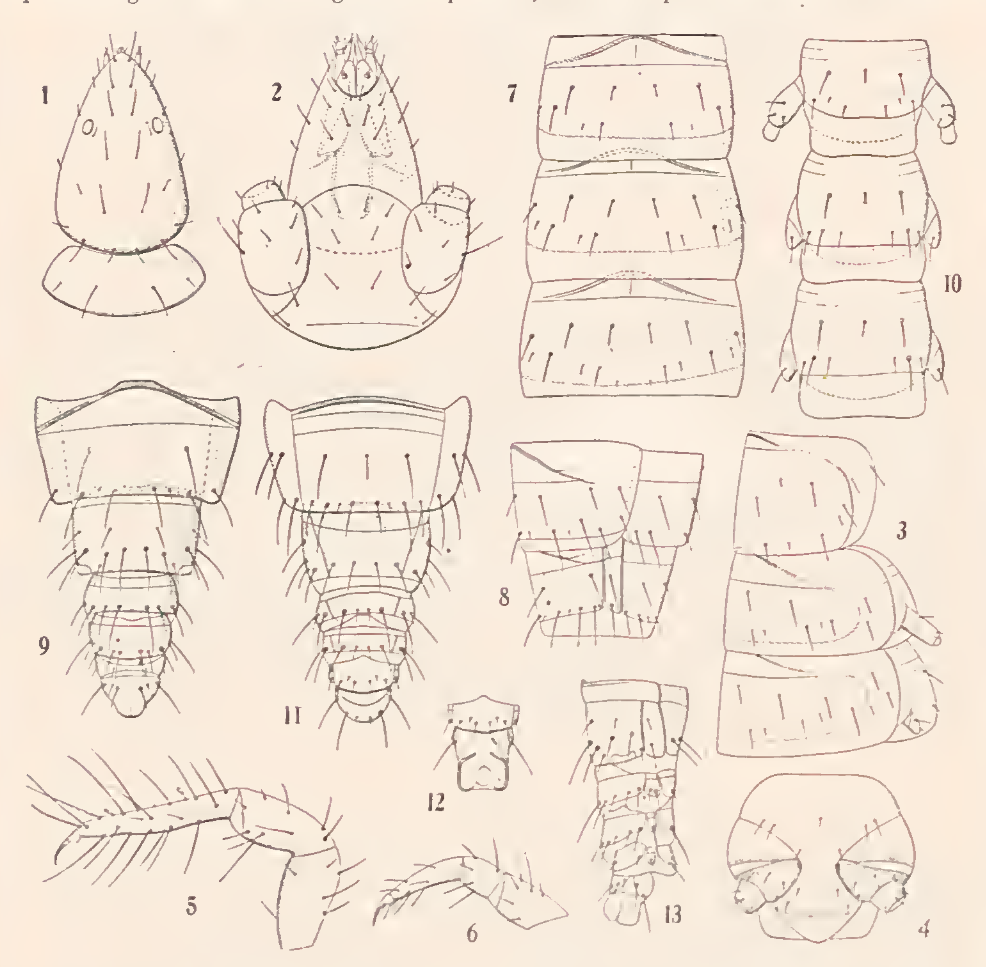


Fig. 1 — *Acerentulus travassosi:* — 1. caput et pronotum prona; 2. caput et prothorax cum pedum articulis primo et secundo supina; 3. metanoti et abdominis primum et secundum segmenta lateraliter inspecta; 4. mesothorax supinus cum pedum articuli primus et secundus; 5. pes primi paris a femore, lateraliter inspectus; 6. pes tertii paris a femore; 7. abdominis tergita primum ad tertium; 8. abdominis segmenta septimum et octavum lateraliter inspecta; 9. abdominis pars postica a segmento septimo prona; 10. abdominis sternita primum ad tertium cum appendicibus; 11. abdominis pars postica a segmento septimo supina; 12. abdominis segmentum decimum primum supinum cum ovipositore extroflexo; 13. abdominis pars postica a segmento octavo, lateraliter inspecta. (Figurae omnes varie ampliatae).

Abdomen. Tergita 1-7 cercine antico chitineo bene evoluto lateraliter aliquantum arcuato et plus minusve bifurcato setis brevibus et brevioribus utrimque 10-11 ut figurae 1, 3 et 7 demonstrant, paratergitis 1.º at 6.um paul-

lum robustis et haud vel vix antice distinctis, segmenti 7.i linea bene separatis; sterna 1-7 seta mediana breviore, seta utrimque sublaterali brevi et setis posticis 3 + 3, quarum sublateralis parum longior est. Segmentum octavum tergito setis utrimque 10, quarum duae per paratergitum dispositae, pectine postico laterali aciculis minimis 5-6 instructo, sterno setis posticis 4 aucto; segmentum nonum setis posticis 5 + 5 superis, duabus per paratergitum, sterno setis 2 + 2, quarum submedianae breviores; segmentum decimum tergito setis 5 + 5, paratergito seta singula, sternito setis posticis 2 + 2 praecedenti similiter; segmentum decimum primum tergito breviore setis minimis duabus aucto, paratergito seta singula, sternito setis brevissimis 3 + 3; segmentum decimum secundum setis 3 + 3, quarum sublateralis minima est, sterno setis 3 + 3, quarum submedianae minimae.

Appendices abdominales segmenti primi et secundi et tertii forma generi typica.

Ovipositor introflexus valvulis apiculibus brevibus, subtriangularibus.

Long. corporis mm. 1, lat. metanoti 0,15, long. pedum paris primi 0,26.

Habitat. Exempla tria in nemoris humo ad Campinas legi. (Typus in collectione mea; paratypus in collectione « Instituto biologico, Sao Paulo » observatus est).

Observatio. Speciem hanc et sequentem ad genus *Acerentulus* Berl. pro tempore adscrilo, quia *Acerentomidarum* generum revisio necessaria est ante genera jam descripta bene definita existimentur.

Acerentulus tristani sp. n.

(Fig. 11).

Femina. — Corpus plus minusve ferrugineum.

Caput parum minus quam duplo longius quam latius, setis, praeter setam utrimque sublateralem breviorem ad pseudocellos absentem, ut in specie praecedente sed parum longioribus; palpi maxillares 3-articulati, articulo secundo crassiore, tertio angustiore; palpi labiales tuberculiformes.

Thorax. Pronotum seta sublaterali quam lateralis fer 2/3 longioribus; meso- et metanotum setis superis utrimque 5 sat longis et 3 brevibus et brevissimis ut fig. 11, 1-2 demonstrant.

Prosternum setis utrimque tribus parum longis; meso- et metasternum seta mediana et utrimque setis quinque brevibus instructa.

Pedes primi paris ungue apicali simplici longa quam tarsus fere 2/3 breviore tarso setis sat longis, quarum subapicalis quam tarsus 1/3 brevior et dorso sensillo pyriformi proximali et sensillis chaeticis brevibus crassiusculi submediano et subdistali instructo; pedes secundi et tertii paris ungue apicali seta basali et utrimque acicula minima setiformi brevissima, proximali instructa.

Abdomen. Tergitum primum supra setis utrimque 4 transverse biseriatis, tergita 2-5 supra setis utrimque 5 et lateraliter et subtus setis 3 sat longis instructa; tergita 6-7 setarum numero ut tergita praecedentia sed serie transversa antica setis tantum 1 + 1, setis ceteris superis posticis. Tergita 8-10 brevibus et brevioribus posticis vel subposticis ut fig. 11, 6 demonstrat, segmenti octavi pectine laterali postico laciniis minimis 7-8 instructo, tergito decimoprimo setis nullis, decimo secundo setis duabus submedianis brevibus.

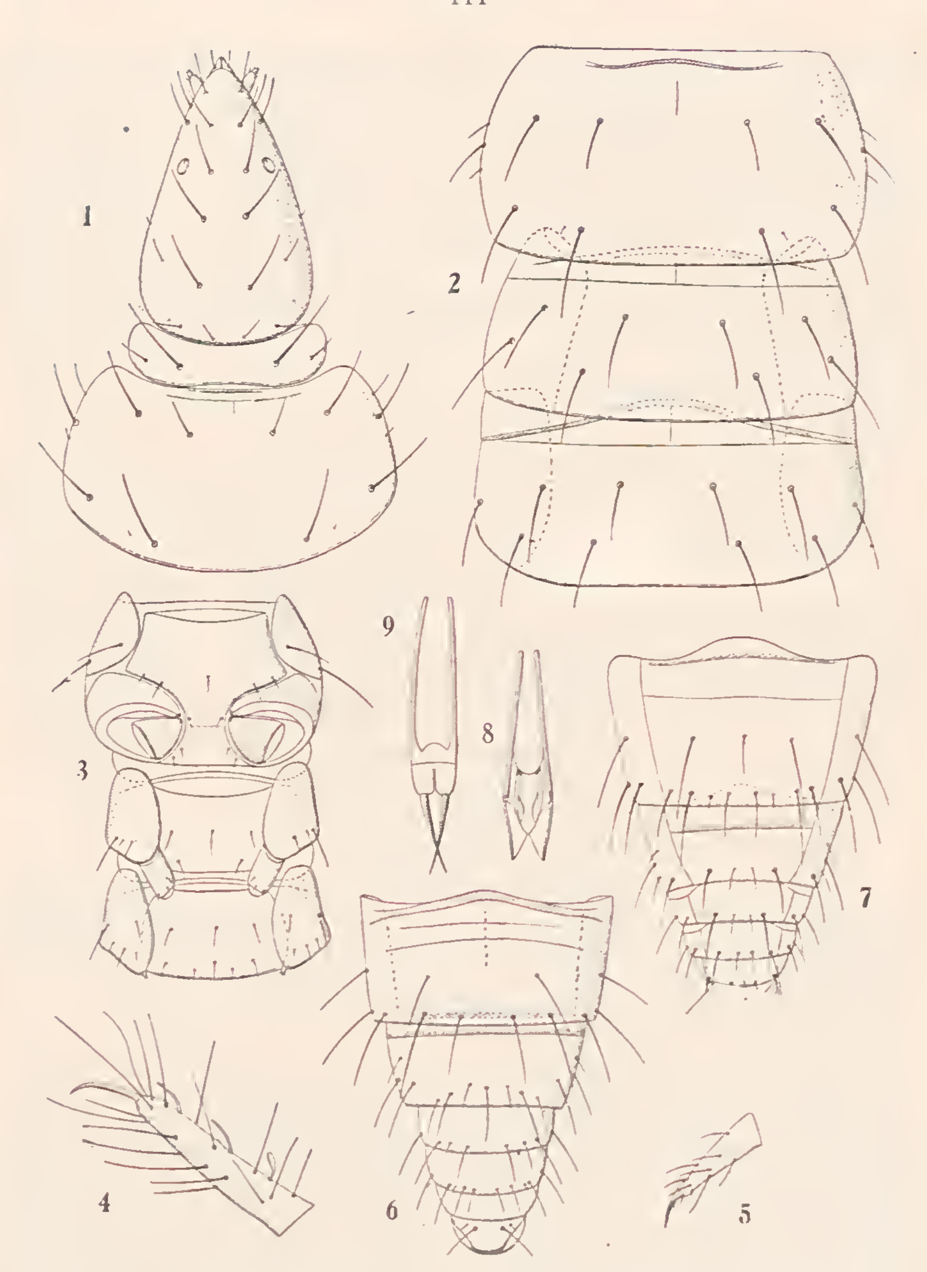


Fig. II — *Acerentulus tristani:* 1. caput, pronotum et mesonotum prona; 2. metanotum et abdominis tergita primum et secundum; 3. metathorax et abdominis segmenta primum et secundum supina; 4. pedis primi paris tarsus et praetarsus lateraliter inspecti; 5. pedis tertii paris tarsus et praetarsus; 6. et 7. abdominis pars postica a segmento septimo prona et supina; 8. feminae ovipositor; 9. maris appendix genitalis.

Sternita: primum seta mediana et setis utrimque duabus, 2.um et 3.um etiam seta mediana postica et utrimque seta minima sublaterali postica, sternita 4.um ad 7.um setis subanticis tribus, quarum mediana brevis est et setis posticis 8, quarum sublaterales longae et intermediae, ad latus externum submedianarum, brevissimae sunt.

Appendices abdominalis segmentorum 1-3 consuetae sunt.

Ovipositor introflexum valvulis apicalibus brevibus, triangularibus

Mas. — Appendix genitalis processibus apicalibus conicis attenuatis longis, quam ceterae appendicis eiusdem longitudinis dimidia pars parum brevioribus.

Long. corporis mm. 1,10, lat. metanoti 0,16, long. pedum primi paris 0,28.

Habitat. Costarica: S. José, Orijuaco.

Observatio. Species haec, in memoriam Frid. Tristan dicata, pedis primi paris ungue longitudo facile distinguenda est.

Goezia sigalasi n. sp., parasite d'une « vive » (Trachinus draco)[1]

Witold Stefanski
Laboratoire de Zoologie et de Parasitologie de la Faculté Vétérinaire de l'Université de J. Pilsudski
à Varsovie — Pologne

[Avec 1 planche]

Au cours de mes recherches sur les parasites des poissons à Arcachon, Monsieur le professeur R. Sigalas, directeur de la Station Biologique, m'a confié pour la dissection une vive *(Trachinus draco)* tombée à l'aquarium le 19 juillet 1935.

D'après les renseignements du personnel du laboratoire, cette vive, provenant de la baie d'Arcachon, séjournait à l'aquarium environ trois semaines.

Après avoir ouvert ce poisson, je fus tout de suite frappé par l'aspect anormal des viscères. En effet, le tractus intestinal était fortement rétréci, les appendices pyloriques presque complètement atrophiés et le lobe gauche du foie en grande partie détruit. Sous les séreuses de tous les organes, en particulier des ovaires et des reins, ainsi que dans le parenchyme du foie se trouvaient les Nématodes, distincts déjà à l'oeil nu. Par contre, ils faisaient complètement défaut dans le tube digestif. — J'en ai récolté 12 exemplaires, mais le nombre total de Nématodes se trouvant dans la cavité péritonéale de ce poisson peut être évalué à une centaine.

Un examen rapide sous le microscope m'a permis de rapporter ces Nématodes au genre *Goezia* Zeder, 1800.

Comme les espèces de *Goezia* ne furent jamais trouvées, à ma connaissance, chez les vives et d'autre part tous les auteurs décrivant ces espèces les signalèrent comme habitant l'estomac[2], il m'a paru intéressant d'attirer l'attention des helminthologues sur ce cas exceptionnel, d'autant plus que mon riche matériel m'a permis de reconnaître dans ce matériel une espèce qui me parait nouvelle.

Et d'abord la question doit être posée, si la vive peut être considérée comme l'hôte normal pour le *Goezia* en question?

Comme nous venons de mentionner ce Nématode ne fut jamais trouvé dans ce poisson. En effet, *G. ascaroides* ne fut trouvé que chez *Silurus glanis* (L.) profondement enfoncé dans la muqueuse des plis de l'estomac[3]. *G. spinulosa* fut trouvé par Diesing (1839), de même que par Baylis (1927) dans l'estomac de poisson d'eau douce de Brésil, *Arapaima gigas* et *G. kollari*, dans l'estomac de *Chrysophrys aurata*. Comme le dernier, *G. annulata* fut trouvé à Padoue,

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[1] J'ai le plaisir de dédier cette espèce à Monsieur le prof. *Sigalas*, qui a bien voulu me confier cet intéressant matériel.

[2] A l'éxception de *Linton* (1889), v. plus loin.

[3] Tous ces renseignements se trouvent dans l' excellente mise au point de *Dollfus* (1935).

dans l'estomac d'un *Morone labrax*. Suivant Molin (1859) deux femelles avaient perforé la muqueuse et leurs extrémités antérieures étaient engagées dans l'épaisseur de la paroi stomacale. La même espèce fut en outre trouvée (Sonsino, 1890) chez *Umbrina cirrosa* et *Mugil cephalus*. Enfin en Amérique du Nord on la signala dans de nombreuses espèces de poissons. En particulier Linton (1889) trouva un mâle de cette espèce dans le péritoine de *Roccus lineatus*. De même McCallum (1921) trouva cette espèce chez le même poisson. Les parasites « avaient creusé des galeries sous la muqueuse stomacale et plusieurs habitaient la même cavité »[1].

Hsü décrivit en 1933 une nouvelle espèce *G. nankingensis* provenant de l'estomac de *Psephurus gladius*. *Leiocassis longirostris* et *Parasilurus asotus*.

Enfin Maplestone (1930) trouva une seule femelle d'une espèce qu'il croit nouvelle — *Goezia gavialidis* — dans l'estomac d'un *Gavialis gangeticus*. L'auteur fait cependant remarquer qu'elle pouvait provenir d'une poisson:

> « At the same time it must be remembered, that although all the members of this genus hitherto described have been found in fish, the present worm is in a fish eating animal. and is possibly a true parasite of a fish, which has only been liberated by digestion from its true host in the stomach of the Ghavial in which he was found ».

Ajoutons que parmi les 12 exemplaires de *Trachinus draco* disséqués par moi, les parasites en question ne se trouvaient que dans un seul poisson, provenant de l'aquarium. En tenant compte en outre de profonds changements pathologiques, provoqués par les parasites du fait de leur habitat anormal, il me semble juste de conclure que *Trachinus draco* ne fut dans ce cas qu'un hôte accidentel. Je trouve la confirmation de cette opinion dans le travail de Denecke (1935) lequel décrit des profonds changements pathologiques, dans l'estomac de l'anguille, provoqués par les larves de *Goezia* indeterminés.

DESCRIPTION DES PARASITES

Parmi le matériel récolté j'ai pu distinguer 5 mâles, 17 femelles et 20 juven.

Dimensions: — Mâle L = 3 mm. 37 (2.76-4.14); $\alpha = 9$ (8.4-9.5); $\beta = 6.1$ (5.7-7.2); $\gamma = 43.8$ (34.6-51.0); n = 4.

Femelle L = 5 mm. 31 (4.32-6.12); $\alpha = 9.7$ (8-11.3); $\beta = 5.6$ (4.3-6.8); $\gamma = 32.4$ (25-42.6); n = 4.

Juven. L = 2 mm. 25 (1.48-3.31); $\alpha = 12.2$ (8.7-16.5); $\beta = 5.5$ (4.8-6.2); $\gamma = 39$ (23-65); n = 3.

C'est une des plus petites espèces connues. — Seule *G. minuta* Chandler, 1935, connue d'après un seul exemplaire mâle mesure 3 mm. de longueur. *G. annulata* (Molin, 1859) présenterait d'après leurs auteurs une variation en longueur de 3 à 25 mm. Mais il n'est pas certain si Molin n'avait à sa disposition uniquement les jeunes exemplaires. non différenciés sexuellement et d'autre part le synonyme de cette espèce, vu l'amplitude de variation de sa taille, me parait incertain.

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[1] Cité d'après *Dollfus* (1935).

Le vers présente la forme habituelle aux espèces de *Goezia*, c'est à dire plus ou moins arquée. Il est tronqué à l'extrémité antérieure et plus atténué à l'extrémité postérieure. Sa plus grande largeur qui se trouve un peu en arrière du milieu du corps est 0 mm. 37 (0.3-0.45) pour les mâles et 0 mm. 54 (0.49-0.6) pour les femelles.

Le coefficient α de de Man, qui exprime la relation entre la longueur du corps et sa largeur, fait ranger nos parasites parmi les espèces à la forme du corps relativement ramassée. Calculé d'après les données des auteurs, ce coefficient se présente: chez *G. spinalosa* $\alpha = 24$-44, l'espèce au corps le plus élancé; vient ensuite *G. nankingensis* avec $\alpha = 15$-16, *G. ascaroides* avec $\alpha = 13$; *G. gavialidis* avec $\alpha = 11$; *G. annulata* dont le coefficient α subi de très grandes variations, 3.3 (Stossich, 1887) à 13.3! (Linton, 1901) et enfin *G kollari* — l'espèce dont le corps est très ramassé avec le coefficient $\alpha = 5.3$.

Comme chez toutes les espèces de *Goezia*, la cuticule est ornée de légers renforcements annulaires, dont les bords postérieurs portent des spinules à pointe dirigée vers l'extrémité caudale. On observe cependant sous ce dernier rapport quelques irrégularités au voisinage de l'anus ou à l'extrémité caudale, où les pointes de nombreuses spinules sont dirigées vers l'extrémité céphalique.

Il n'est pas facile de compter exactement le nombre d'épaississements annulaires, surtout aux extrémités céphalique et caudale, où ils deviennent très serrés. J'en ai compté cependant chez un mâle (L = 3 mm. 16) 259, ce nombre variant chez les quatre femelles de 262 (L = 1 mm. 32) à 323 (L = 5 mm. 76) Je n'ai pas pu cependant établir une relation directe entre la longueur de l'animal et le nombre d'anneaux, la plus grande femelle (6 mm. 12) présentant le même nombre d'anneaux que la plus petite. On en distingue 38-53 dans la région de l'oesophage et 200-250 dans la région comprise entre l'oesophage et l'anus. Par contre, leur nombre parait constant dans la région caudale (20 à 21).

Comme je viens de mentionner, les rangées de spinules sont séparées par des distances plus ou moins grandes. Voici leurs distances respectives chez une femelle mesurant 5 mm. 76.

Distance	entre	les premiers	anneaux	cuticulaires	— 9	microns.
„	„	11- 12	„	„	— 14	„
„	„	28- 29	„	„	— 24	„
„	„	38- 39	„	„	— 18	„
„	„	100-101	„	„	— 43	„
„	„	300-301	„	„	— 9	„

Ainsi donc les anneaux étant très serrés immédiatement en arrière des lèvres, s'écartent progressivement jusqu'au niveau de la région postérieure de l'oesophage (31-53-me anneaux), atteignant cependant le maximum encore en — deça de cette limite (vers le 31-me anneau).

Jusqu'au niveau de la vulve et même un peu en arrière du milieu du corps, cet écartement diminue très insensiblement, pour redevenir très petit encore bien en avant de l'anus. Enfin, à partir de ce dernier (300-301 anneaux) les renforcements cuticulaires redeviennent aussi serrés qu'à l'extrémité céphalique.

Suivant la région du corps les spinules modifient leur forme.

La fig. 1 représente les rangées de spinules, choisies dans les différentes régions du corps, mais autant que possible dans les endroits dessinés déjà par Dollfus (1935), le seul auteur qui les a décrites d'une manière plus détaillée.

Ainsi les spinules de la 15-16 rangées de mon specimen correspondent. quant à leur forme aux spinules représentées sur la fig. 2 de Dollfus. Elles sont chez les deux specimens « longues et étroites et ont, vues de face, une forme de triangle isocèle ».

Peu à peu le nombre des spinules devient réduit et sur le 55-me anneau il y en a 80 (au lieu de 120 sur le 15-me). En même temps elles deviennent plus grandes, avec la base d'insertion plus élargie. Elles présentent également la même forme vers le milieu du corps à l'encontre de specimens de Dollfus, où elles deviennent fortement réduites et espacées (fig. 5). Quoique certaines d'entre elles (20-me et 11-me anneaux) à partir de l'anus vers l'extrémité céphalique prennent la forme en écusson, comme sur la fig. 6 de Dollfus, elles ne sont jamais aussi espacées, au contraire leurs bases d'insertion sont par place contiguës et la rangée est composée de spicules très serrées. La queue est couverte d'épines, dont la forme varie dans la même rangée depuis celle d'un triangle isocèle à la forme d'écaille. Elles s'arrêtent cependant à la distance de 96 microns du sommet caudal, les dernières rangées devenant irrégulières et peu apparentes.

En ce qui concerne l'écartement des rangées de spinules, seul *G. spinulosa* Dies. correspond à ta description de mon matériel: dans les deux cas la distance maximum entre les deux rangées se trouve dans la région postérieure de l'oesophage. Par contre, chez cette dernière espèce le corps est plus large vers ses deux extrémités qu'à son milieu et il atteint sa plus grande largeur vers l'extrémité caudale (Baylis, 1927), soit vers l'extrémité antérieure (Fig. 10, pl. III, Drasche, 1883).

Comme chez toutes les espèces du genre *Goezia*, les lèvres sont séparées du corps par un profond rétrécissement annulaire, non recouvert des spinules. La hauteur des lèvres varie suivant la longueur des individus de 0 mm. 028 à 0 mm. 035. Chez cette dernière femelle la lèvre dorsale atteignait 0 mm. 12 de largueur, sur 0 mm. 068 d'épaisseur (sans auricules).

Les lèvres (Figs. 2 et 3), autant qu'on puisse juger, surtout d'après les dessins de Hamann (fig. 6, pl. IX), de Baylis (fig. 1. 1927) et de Hsü (fig. 5, 1933), sont construites sur le même plan chez toutes les espèces. Elles sont charnues et revêtues à l'extérieur d'une épaisse couche cuticulaire. La partie correspondant au pulpe, présente une légère dépression. La seule différence qui existe dans la structure des lèvres entre *G. annulata*, *G. spinulosa* et *G. sigalasi* d'une part et *G. nankingensis* d'autre part, c'est l'absence chez cette dernière espèce d'une profonde incision, séparant deux auricules, dirigées vers la bouche. En outre, je n'ai pas pu distinguer la rangée interne des minuscules papilles, représentées par Hsü [5].

Mentionnons encore que dans chacun des auricules, il y a une portion de pulpe, séparée de la masse principale.

L'oesophage (Fig. 4) de la longueur assez constante, 0 mm. 9 à 0 mm.

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[5] Elles ne figurent pas non plus sur le dessin de *Baylis* (1927).

99, chez la femelle est plus dépendant de la taille du mâle (0 mm. 38 - 0 mm. 72). Je n'ai rien à ajouter à la description des auteurs, sauf, détail important, j'ai pu distinguer deux coecums oesophagiens: deux grêles tubes de 19 microns de diamètre, prenant naissance à l'extrémité postérieure de l'oesophage. — Malheureusement je n'ai pu les poursuivre qu'à la distance de 0 mm. 9 où ils se perdent dans les circonvolutions de l'intestin. — D'après les données des auteurs leur longueur ne dépasse pas 1 mm. 5. Par contre, le caecum intestinal est court et prismatique (0 mm. 24 - 0 mm. 27 chez le mâle et 0 mm. 36 - 0 mm. 15 chez la femelle)[6].

A la distance de 180 microns de l'extrémité antérieure se trouve l'anneau nerveux, réunis par les fibres avec un important ganglion nerveux, situé immédiatement au-dessus du sommet du caecum intestinal.

Chez la femelle de la longueur de 5 mm. 7 la vulve (Fig. 5) se trouvait un peu en avant du milieu du corps (18 p. 100), c'est à dire éloigné à la distance de 2 mm. 77 de l'extrémité antérieure (101-102 rangées des spinules). Le vagin se dirige vers l'extrémité caudale.

La queue (Fig. 6) chez les deux sexes est courte. Elle est longue de 0 mm. 07 à 0 mm. 08 chez le mâle et 0 mm. 16 (0.13-0.18) chez la femelle. Un peu en arrière de son milieu, la queue se rétrécit brusquement en prenant une forme plus ou moins cylindrique. Nous avons déjà mentionné que cette partie n'est couverte des spinules que dans sa partie supérieure.

De même que chez *G. annulosa* et *G. nankingensis*, la queue se termine par une minuscule pointe, cependant que cette dernière est entourée chez mon espèce d'un verticille de petites productions papilliformes, décrites par Dollfus (fig. 8, 1935) chez *G. ascaroides* et figurées par Hamann (1895) chez *G. annulata* (fig. 3, pl. IX).

Comme l'a remarqué justement Dollfus (l. c.) « *G. nankingensis* est la seule espèce du genre, pour laquelle on connaisse, par des figures, l'emplacement et la disposition précise des papilles caudales du mâle ».

Or, ces papilles (Fig. 7) diffèrent chez mon espèce tant au point de vue de leur nombre qu'au point de vue de leur disposition. Il y a donc exactement 9 papilles préanales, divisées en deux groupes, dont les cinq premières (à partir de l'anus) formant le premier groupe, ne sont séparées que par des petites distances (8-10 microns). En outre, les papilles voisines de l'anus s'approchent de la ligne médiane du corps, tandis que chaque papille suivante s'en écarte davantage. Par contre, les distances entre les papilles du second groupe (composé de 4 papilles) sont beaucoup plus grandes, en dépassant 100 microns.

Il y a en outre une paire de petites papilles submédianes, immédiatement en arrière de l'anus et deux paires de papilles dans la région des dernières rangées des spinules.

Les spicules sont grêles et longs, le spicule droit mesurant 0 mm. 65 et le spicule gauche 0 mm. 54.

Quelques mots encore sur les formes jeunes, rencontrées dans la cavité péritonéale.

Le juvenil le plus petit, mesurait 1 mm. 18. Il présentait déjà tout le faciès, caractéristique du genre. A l'extrémité caudale se trouvait même un

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[6] La figure 4 représente le caecum chez un jeune individu, où la forme du caecum n'était pas très typique.

verticille des productions papilliformes. Cependant, les lèvres n'ont pas encore reçu leur forme definitive et les spinules, quoique déjà formées, deviennent à peine perceptibles en arrière du milieu du corps.

DISCUSSION

Notre *Goezia* s'approche par l'écartement maximum des rangées des spinules au niveau de la moitié postérieure de la région oesophagienne, ainsi que par la forme des lèvres de *G. spinulosa* (Diesing. 1839), il en diffère cependant:

1) — par sa taille 3-4 fois plus petite;
2) — par sa forme du corps plus ramassée ($a = 9.7$ contre 28 à 44!);
3) — par la présence à l'extrémité caudale d'un verticille des productions papilliformes;
4) — par la forme de la pointe caudale;
5) — par le nombre et distribution des papilles caudales (il y en a 12-15 suivant Baylis et point de papilles postanales).

Il diffère de *G. kollari* (Molin, 1853) par la forme des spinules et la présence chez ce dernier d'un grêle appendice caudal.

Il s'approche de *G. annulata* (Molin 1859), surtout celui de Hamann (1895) 1) — par sa forme générale du corps, 2) — par la forme des lèvres, 3) — la forme de la queue avec le verticille des productions papilliformes. Il en diffère cependant 1) — par sa taille quatre fois plus petite, 2) — par l'écartement maximum vers la 30-me rangée (pour Hamann les premières trente rangées sont tellement serrées qu'il y a à peine l'espace entre elles). Ce dernier caractère le différencie également du matériel de Stossich (1887), ainsi que de celui de Mc Callum (1921) où les rangées de spinules «gardaient à peu près le même écartement, presque jusqu'à l'extrémité postérieure du corps» (cité d'après Dollfus, 1935).

Il s'approche également par sa taille de *G. gavialidis* Maplestone, 1930, mais en diffère par l'écartement des stries et les spinules, lesquels chez l'espèce de Maplestone sont approximativement de la même grandeur, excepté de la région caudale, où les striations sont plus serrées et les spinules minuscules.

G. nankingensis Hsü. 1933, le seul décrit de la manière plus détaillée, diffère de notre espèce 1) — par la forme de la queue, 2) — le nombre et l'arrangement des papilles pré- et postanales et les spicules ramassés.

Notre espèce s'approche enfin de *G. ascaroides* (Goeze, 1782), tel qu'il fut décrit par Dollfus (1935), par la forme des premières rangées de spinules, ainsi que par la présence d'un verticille de production papilliformes.

Il en diffère cependant par sa taille quatre fois plus petite et la forme, ainsi que la disposition des spinules dans la région de la vulve et en avant de celle-ci.

Enfin *G. minuta* Chandler, 1935, décrit par l'auteur d'après l'unique specimen mâle diffère de notre espèce par sa forme cylindrique du corps, écartement maximum des rangées de spinules vers le milieu du corps et la longueur des spicules.

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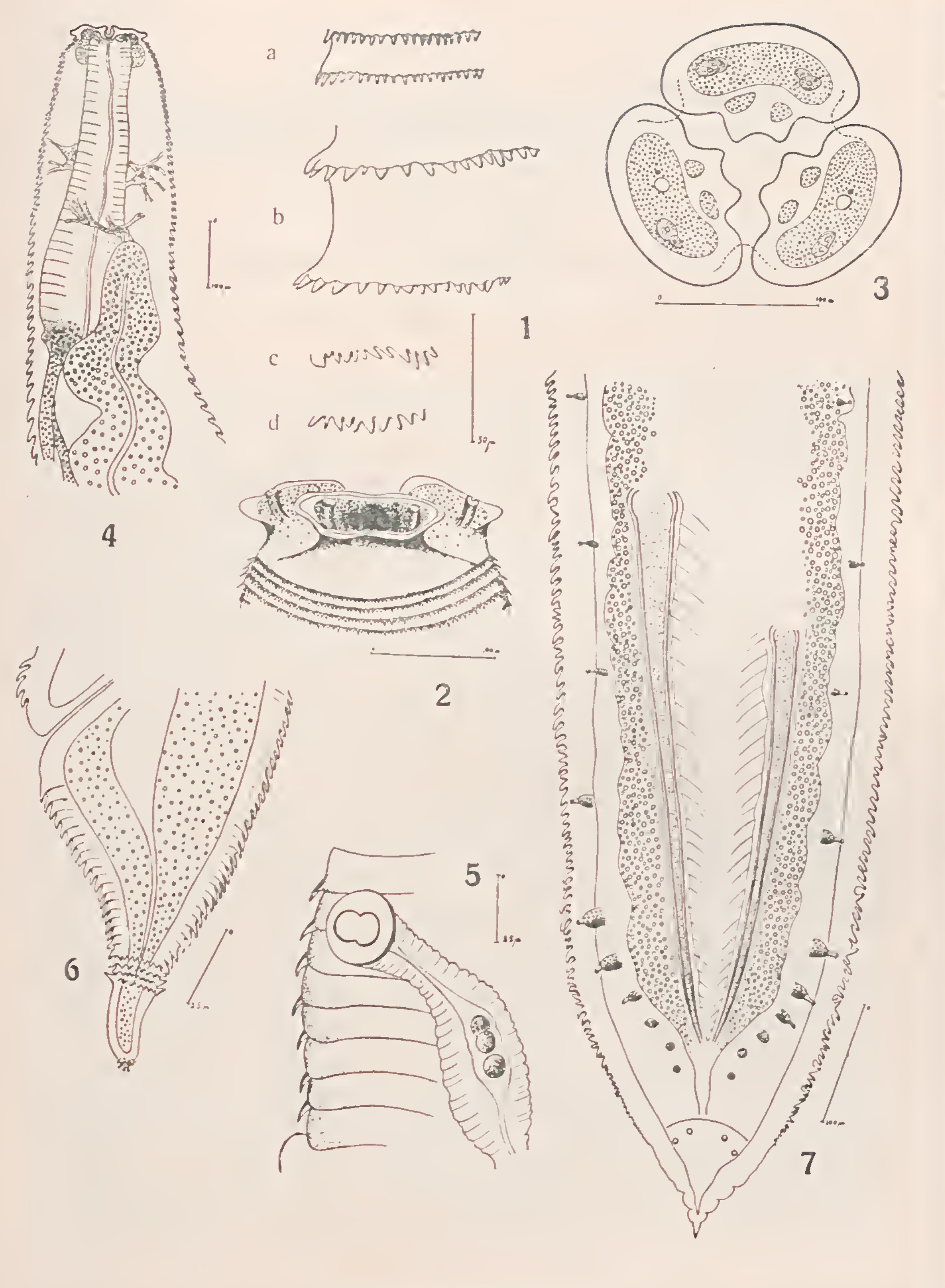
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Planche 1

Goezia sigalasi n. sp.

Fig. 1 — Rangées de spinules: *a.* 15-16 rangées; *b.* 55-56 rangées; *c.* 20 rangée à partir de l'anus; *d.* 11 rangée à partir de l'anus dans la diréction de la région céphalique.
Fig. 2 — Région céphalique, vue du côté dorsal.
Fig. 3 — Lèvres vues d'en haut.
Fig. 4 — Extremité antérieure. Oesophage avec les caecums oesophagiens et intestinal.
Fig. 5 — Vulve et le vagin.
Fig. 6 — Extrémité caudale de la femelle.
Fig. 7 — Extrémité caudale du mâle.



Stefanski : *Goezia sigalasi* n. sp.

Skrjabingylus nasicola (Leuckart, 1842) Petrow, 1927, a nematode parasitic in the frontal sinuses of American Mustelidae

W. E. Swales
Institute of Parasitology, McGill University, Macdonald College, P. Q. – Canadá

[With 1 plate]

The identity of the nematode parasite of the frontal sinuses of *Mustelidae* was the subject of considerable confusion in European literature until Petrow (4), in 1928, clarified the situation by explaining the systematics of *Filaroides bronchialis* and *Skrjabingylus nasicola.* He showed that the forms described by Weijenbergh in 1868, Linstow in 1873, Stossich in 1897, and by Cameron in 1927, as *Filaroides mustelarum* (Rud.) were really *Spiroptera nasicola* Leuckart, which, in 1927, he had redescribed and assigned to a new genus, *Skrjabingylus.* Baer (1), in 1931, described this nematode as occurring in the frontal sinuses of *Putorius putorius* L., *Martes foina* Erx., *Martes martes* L., *Arctogale nivalis* L., *Arctogale erminae* L., *Lutreola lutreola* L., and *Lutra lutra* L. and mentioned the known distribution in Germany, Russia and Switzerland, but did not mention the form described by Cameron (3) from *Mustela nivalis* in Great Britain. Baer mentioned a possible record for North America in the nematodes described by Woodworth in 1897 from the frontal sinuses of *Mephitis* spp. and *Spilogale* spp. as *Filaroides muslelarum.*

There appears to be doubt at present regarding the identity of the nematode responsible for the rather considerable injury to the skulls of North American *Mustelidae.* Several inquiries have been received by this Institute from zoologists who have had occasion to examine skulls in museum collection. In February, 1937, Dr. Ian McT. Cowan of the Provincial Museum of British Columbia, forwarded seventeen specimens of nematodes which he collected from the frontal sinuses of a Vancouver Island weasel, *Mustela cicognani anguinae.* Dr. Cowan stated that it was the first time he had found the nematodes actually in the host, although approximately 50 % of the weasels and skunks he had examined had shown signs of prior infestation.

Dr. R. M. Anderson, Chief of the Division of Biology, National Museum of Canada, who had previously made inquiries and supplied information regarding skull injuries in *Mustelidae,* kindly examined the skulls present in the national collection. Of the 426 skulls examined, 41, or 9,7 %, showed obvious lesions of parasitic infestation of the frontal sinuses, and due to the fact that many of the other skulls had been injured by the trappers, this percentage is certainly a low estimate of the incidence. The lesions noted by Dr. Anderson were distributed as follows: —

Mustelidae	*N.º of skulls examined*	*N.º showing lesions*
Martes americana / *M. caurina*	53	0
M. pennanti	4	0
Mustela cicognanii	81	24
M. arctica	9	2
M. rixosa	3	0
M. longicauda	21	2
M. frenata	14	3
M. vison	143	0
M. nigripes	2	0
Gulo luscus	19	0
Lutra canadensis	23	0
Enhydra lutris	1	0
Spilogale phenax	11	6
M. occidentalis / *Mephitis mephitis*	34	4
T. taxus neglecta / *Taxidea taxus taxus*	16	0

The infested animals had been collected from the provinces of Quebec, Ontario and British Columbia, indicating a general distribution throughout Canada.

Dr. E. Raymond Hall, University of California, in a letter to Dr. Anderson in regard to skull injury, stated that he had noticed a marked variation in the infestation of the frontal sinuses of weasels. Specimens of long-tailed weasels *(Mustela frenata?)* from the State of New York almost invariably have deformed frontal sinuses, where those from Texas almost never show deformation. Dr. Hall also expressed uncertainty regarding the nature of the causative agent.

Dr. T. W. M. Cameron, in a personal communication, stated that skull injury in Scottish *Mustelidae* was commonly observed by zoologists.

It appears that parasitic infestation of the frontal sinuses of certain *Mustelidae* is common and is widely distributed in the temperate parts of the northern hemisphere.

Regarding the identity of the European forms, all workers appear to be agreed that the specimens so far studied belong to the only known species of the genus *Skrjabingylus*, *S. nasicola* (Leuckart, 1842) Baer's (1) description of the specimens from France differs in several points from the description of Petrow, notably in his statements that the vulva of the female is in front of the middle of the body, that the male bursa has 12 supporting rays, and that the male tail ends in a fine point instead of being rounded.

After careful consideration I decided that the Canadian specimens must be assigned to the type species, *Skrjabingylus nasicola* (Leuckart, 1842). It is highly desirable that a comparative study be made of the material collected in Russia, France, Scotland and North America in order to definitely determine the morphology of this very much confused nematode. The following is a description of the material collected in British Columbia by Dr. I. McT. Cowan, from *Mustela cicognani anguinae.*

STRONGYLOIDEA Weinland, 1848.

METASTRONGYLIDAE Leiper, 1908.

BRONCHOSTRONGYLINAE Böhm & Gebauer, 1934.

SKRJABINGYLUS NASICOLA (Leuckart, 1842) Petrow, 1927.

Synonyms: — *Filaroides mustelarum* of Weijenbergh, 1868, of Linstow, 1873, of Stossich, 1897, of Woodworth, 1897, and of Cameron, 1927.
Spiroptera nasicola Leuckart, 1842.
Filaria nasicola (Leuckart) of Stossich, 1897.

Hosts: — *Mustelidae* — *Mustela putorius, Mustela erminea, Mustela nivalis, Mustela foetorius, Mustela lutreola, Mustela frenata, Mustela cicognani anguinae, Martes foina, Martes martes, Lutra lutra, Spilogale phenax, Spilogale* sp., *Mephitis* spp.

Distribution: — Germany, Switzerland, Russia, Great Britain, United States of America, Canada.

Location: — Frontal sinuses.

Life History: — Unknown.

Morphology: — *Skrjabingylus.* Body covered with a thick cuticle; a shallow buccal capsule present. A rudimentary bilobed caudal bursa in the male, each lobe supported by papilla-like rays. Spicules equal or sub-equal, having wide alae; accessory piece present. Vulva near the middle of the body; two divergent uteri. Viviparous. Adults in the frontal sinus of *Mustelidae.* Type and only species, *S. nasicola* (Leuckart, 1842).

Skrjabingylus nasicola (Leuckart, 1842).

Body fairly thick and opaque, red in colour when fresh.

Male: — 7.25-13.00 mm. long by 0.35-0.50 mm. wide at mid-body. Cuticle with strong transverse and fine longitudinal striations. Mouth terminal; buccal capsule shallow and cup-shaped, 20 micra deep by 36 micra wide. Mouth papillae not visible in the Canadian specimens. Head 0.08-0.14 mm. in diameter. Oesophagus 0.5-0.58 mm. long by 0.07 mm. in maximum width, only slightly swollen at the base. Excretory pore 0.4 mm. from anterior extremity. Tail 0.06 mm. long, the extremity rounded except in two specimens which retained a cuticular tip, 8 micra in length. Caudal bursa rudimentary, formed by two thick lobes, 0.068 mm. long by 0.046 mm. wide, joining the body at a latero-ventral position, on each side of the cloaca. Five papilla-like rays visible in each flattened lobe, the sixth one described by Baer could not be observed in these specimens.

Spicules equal or subequal 0.161-0.175 mm. in length, each having a prominent striated ala. An accessory piece present, 40 micra long.

Female: — 10.7-18.0 mm. long, by 0.43-0.46 mm. wide in the region of the vulva. Diameter of head 0.088-0.140 mm. Cuticle thick, with irregular and deep transverse striations. Excretory pore 0.13-0.5 mm. from anterior extremity. Buccal capsule cup-shaped, 20 micra deep by 40 micra in diameter. Oesophagus 0.57-0.63 mm. long by 0.07-0.08 mm. in maximum width. Tail 0.120-0.131 mm. long, ending in a cuticular tip, 8 micra long.

Vulva prominent, from 0.5-1.0 mm. post-equatorial. Two divergent uteri. Larvae dissected from the uteri 0.256 mm. long by 14 micra wide, tail 21 micra long.

It is probable that the available females had not attained their maximum size at the time of fixation, even though they were sexually mature. However, the differences in dimensions from the specimens of Baer (1) do not justify the erection of a new species for these American specimens. These specimens apparently differ from those observed by Cameron (3) in Scotland only in the length of the female tail, a character which can be modified by various means of fixation.

ACKNOWLEDGEMENTS

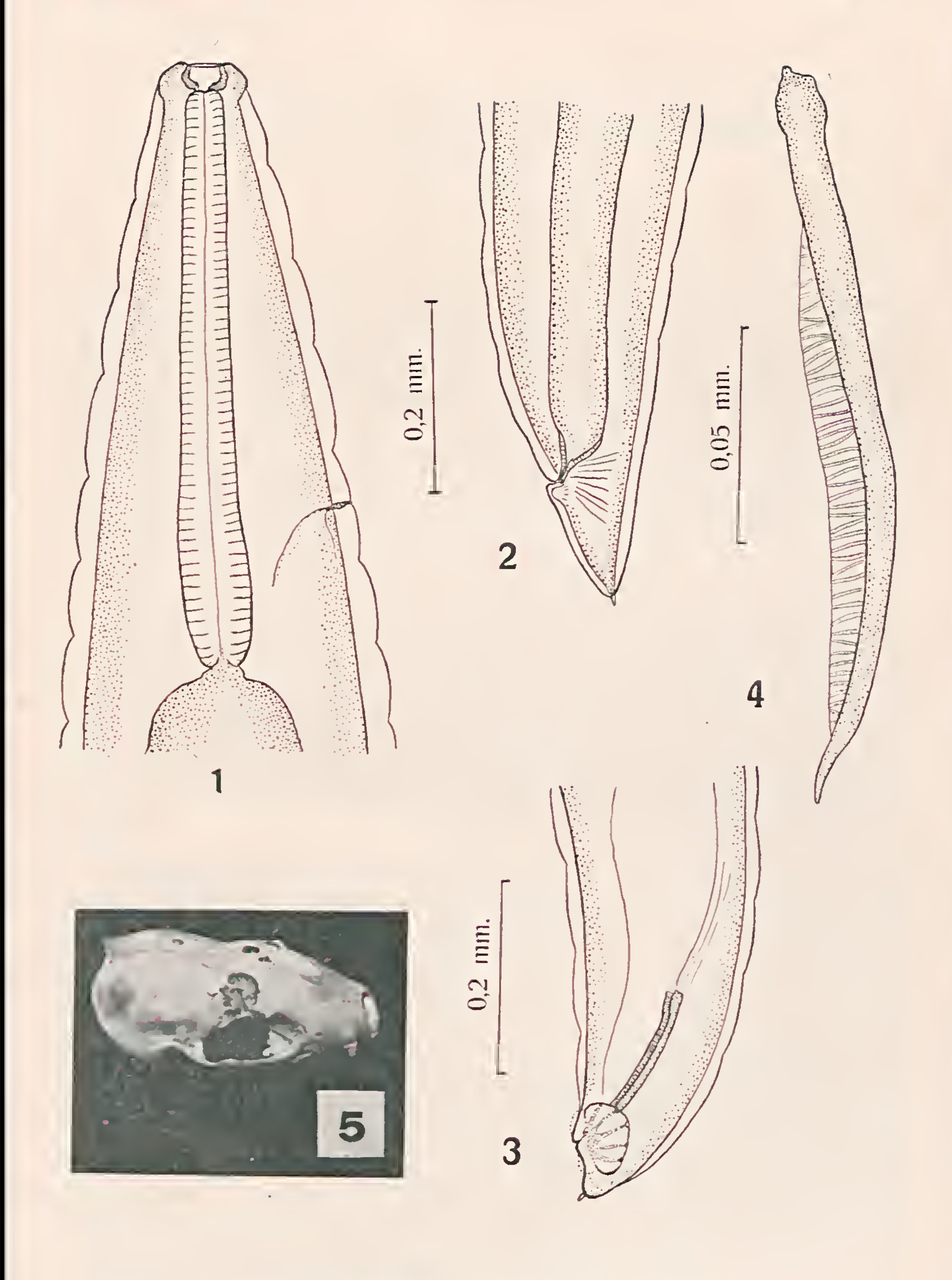
I wish to express appreciation of the kindness of Dr. Ian McTaggart Cowan in supplying the specimens used in this study. Also Dr. R. M. Anderson's data and cooperation in examining the Canadian collection of *Mustelidae* provided a valuable record of the incidence of parasitism in the frontal sinuses of Canadian *Mustelidae*.

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Plate 1

Fig. 1 — *Skrjabingylus nasicola.* Anterior end of female.
Fig. 2 — *Skrjabingylus nasicola.* Posterior end of female.
Fig. 3 — *Skrjabingylus nasicola.* Posterior end of male.
Fig. 4 — *Skrjabingylus nasicola.* A male spicule.
Fig. 5 — *Skrjabingylus nasicola.* A skull of *Spilogale phenax* showing typical bone destruction due to infestation of the frontal sinuses by *S. nasicola.*



Swales: *Skrjabingylus nasicola* (Leuckart, 1842).

Progress of Helminthology in India

Gobind Singh Thapar
Lucknow University, India

I consider it a special privilege to have been asked to contribute an article on the occasion of the Jubilee celebration of Professor Lauro Travassos. His untiring services to the Science of Helminthology will be long remembered and it gives me great pleasure to find that his colleagues and pupils have considered it desirable to commemorate this occasion by issuing a 25-years anniversary volume in his honour. Let me, therefore, join them in offering heartiest felicitations to Professor Travassos on this occasion, on behalf of myself and the associated workers in India. As regards the choice of my subject, I think I could not pay a better tribute to the extensive services of the professor to Helminthological Science than by reviewing the position of helminthological research during the corresponding period in India. This would not only place on record the work done in this country but would also show the great possibilities that still exist for further work on similar lines.

Helminthology received little attention in this country in earlier days. Although there are references to helminths (worms) in ancient literature, specially in Sûsruta, Charaka and Madhava Nidhana, no systematic investigation appears to have been carried out on the subject; in fact, Helminthology as a definite science was not started in India till recently, when by the efforts of some Western investigators reports upon the various collections sent from time to time from India were made. Thus, we find references to Indian Helminthology in the works of Cobbold (1869-1882), Giles (1892), Linstow (1901-06), Gough (1911) and others who have described forms from the Indian collections sent to them.

The preliminary work in India seems to have been carried out by Evans (1908-10) who reported on the diseases of elephants and recorded their parasites from Burma. Another interesting work was by Day (1909) who reported the occurrence of *Coenurus* infection in goats. These earlier studies in helminthology were chiefly conducted by the officers of the Medical and Veterinary services who made occasional reports on the helminths which confronted them in the course of their daily routine.

We, thus, find contributions of Gaiger (1910-15) who compiled the check lists of animal parasites of the domestic animals. Lane (1914-17) recorded his observations on the Ancylostomiasis and indicated also the presence of *Necator americanus* in India. He divided the genus *Ancylostoma* into two subgenera, *Ancylostoma* and *Ceylancylostoma*. During this period he also described the roundworms from the Elephants and several new genera of the suckered roundworms from India, although the validity of some of these latter have recently been doubted by Yorke and Maplestone (1926). A new family, *Dacnitidae*, was also created by him. Lane (1917) further described a new species of *Bunostomum* from goats in India.

The great European war, however, marked the beginning of a new era in helminthological research in India. Leiper (1915-18) while in charge of the Bilharzia Mission in Egypt, drew attention to the possible spread of *Schistosome* infection in India by the return of Indian troops from Egypt and Mesopotamia, and, thus, the Government were greatly concerned in the threatened spread of the infection. The investigations on this and allied problems were, thus, taken up. Soparkar (1918-22), while working at Bombay, made important contributions on the experimental infection of the *Schistosomes* in Indian Molluscs and further added to our knowledge of the group, as also to the life-history problems. One result of his studies, however, was his conclusion regarding the *absence of the specific molluscan intermediaries of Egyptian Schistosomes in India*, in spite of the fact that cercariae were recovered which showed resemblances with the *Schistosome* cercariae. One of them was subsequently identified by him as the larva of the cattle Schistosome. A larval trematode from the Anopheline mosquito was also reported by him and this developed into a form closely allied to *Clinostomum*, a fish trematode. Sewell (1922) published a monograph on the Indian cercariae, a work which was originally taken up by his predecessors, and later (1930) advanced a view regarding the polyphyletic origin of the furcocercous cercariae.

All this was a good heritage. The work on helminthology by zoologists in India was not taken up till 1923, when the study of this economic branch was taken up at some of the Universities. Helminthology is now officially represented at the Veterinary Research Institute. Muktesar and at the School of Tropical Medicine, Calcutta. At the universities, it is extensively studied at Rangoon and at Lucknow, but certain branches are represented also at Aligarh and Allahabad. Through the growing efforts of several enthusiastic workers at these places, a sufficient knowledge has accumulated and all the four groups of helminth parasites — Trematoda, Cestoda, Nematoda and Acanthocephala — are well represented by a fair amount of published work in recognised Journals.

Trematoda

This group includes by far the largest amount of published work from India. Ware (1923) reported on the family *Dicrocoeliidae* from the domestic animals. Mehra (1926) and his colleagues at Allahabad have contributed to the families *Lepodermatidae* and *Spirorchidae*, as well as on the subfamily *Pleurogenetinae*. They have described several new genera and species, while Mehra also attempted to establish the phylogeny of the members of the family *Lepodermatidae*. Verma (1927) at Allahabad reported on a new species of *Opisthorchis* from a fish and pointed out in 1930 the synonymy of *Tremiorchis* with *Centrovitus*. More recently (1935-36) he has made contributions to the family *Bucephalidae* and has added some new forms of Echinostomes from the water birds. Srivastava (1933-36), in a series of memoirs reported on the trematodes of fishes and frogs, and has discussed the systematic position of several genera, i. e., *Vitellotrema*, *Genarchopsis*, *Mehraorchis*, *Clupenurus* and *Orientophorus*. Further, he has reported on the seasonal variation and maximum frequency of infections of some of the trematodes from the frogs. Bhalerao (1925-35), originally from Rangoon and subsequently from Muktesar, described

many new forms from a large variety of hosts in a number of interesting memoirs. His observations (1931) on the occurrence of *Schistosoma japonicum* in pigs in India is rather interesting, particularly because of the absence of such records of infection in man in this country. If this record is confirmed by a study of its life history, *there may be a likely danger of its spread in man as well*, and from this point of view the discovery would be very important. His earlier observations (1932) on the probable infection of *Isoparorchis* in man and domestic animals also deserves mention. His recent publications on the trematodes of Indian animals form a series of interesting memoirs as they deal with the helminths from a majority of Indian hosts. Moghe (1932) and Patwardhan (1935) from Nagpur have described a few new forms from birds.

At Lucknow, the work on the systematic identification of helminth parasites is in progress. Thapar (1929-35) recorded his observations on the trematodes from a variety of hosts. He (1929) described the genus *Gomtia* from an Indian fish, and in 1933 described a new blood fluke, *Tremarhynchus*, from a tortoise. This latter form is interesting as it serves to connect the subfamilies *Spirorchinae* and *Hapalotreminae*. Recently (1936) he has summarized the results of his investigations along with those of the other investigators in a brochure on «Parasitic Worms and Disease» published under the auspices of the Lucknow University. In this book which includes three lectures on certain aspects of helminthology he has discussed the foundations of helminthology and the harm done by helminth parasites to man, animals and agricultural and horticultural plants. In giving references to ancient helminthology, he has quoted their records from Sûsruta, Charaka and Madhava Nidhana, and has identified some of their names according to modern nomenclature in helminthology. The defects in nomenclature in the present-day text books of zoology are pointed out and some of the important advances made in the field are also discussed. He has emphasised the value of co-operation between the various Government departments and the Universities for conducting helminthological research in the country.

Thapar and Dayal (1934) described an interesting trematode from a fish and indicated a probable relationship between *Allocreadiidae* and *Heterophyidae*. Similarly Thapar and Lal (1935) in describing a new trematode, *Psilorchis*, from a bird, drew attention to the probable course of evolution of *Psilostomidae* from *Allocreadiidae*. Lal (1935-1937) in a series of papers has reviewed Avian Trematodes. His review (1936) on the family *Notocotylidae* has attracted considerable attention, as he emphasizes the importance of the genital pore in the diagnosis of the genera and has created several new genera on this character. In his paper (1936) on *Parorchis snipis*, he has further developed the view expressed earlier by Thapar and Lal (1935) and has traced the evolution of the Echinostomes, indicating a polyphyletic origin of the group. Again Lal (1937) has made an exhaustive survey of the characters of systematic importance in the Trematodes for defining the basis of classification of the group. His work on the Avian blood flukes gives an account of an interesting genus that serves to connect the subfamilies, *Schistosominae* and *Bilharziellinae*. The discovery of the genera, *Gigantobilharzia* and *Parorchis* in India reveal a peculiar geographical distribution. He has submitted a dissertation on the Avian Trematodes for the Doctorate of the University of Lucknow.

The entire work, which is in the course of publication, forms a very useful adjunct to the Trematode fauna of India. Sinha (1932-35) has worked out the morphology and the bionomics of the Trematode Parasites of Reptiles and has recorded some interesting observations on several new forms. His discovery of *Lissemysia* from a tortoise gives a record of the first representative of the family, *Aspidogastridae* from India. Another form of interest, which Sinha has discovered is *Gomtiotrema*, as it bears multiple testes like *Spirorchinae* and the ventral sucker like *Hapalotreminae*. This indicates the phylogeny of the genera included under the family *Spirorchidae* and further shows the inadequacy of subdividing the family.

Datta (1932) at Muktesar discovered the cause of « nasal granuloma » of cattle and found it to be due to the presence of a Schistosome. This discovery is of great interest, as it entirely throws out the earlier notions regarding the mycotic origin of the disease, and accounts for the importance of helminthological studies in the diseases of animals.

At Madras, Anantrao and his colleagues have added to our knowledge of the Trematodes of the domestic animals. Besides describing several new species of Cercariae, Rao (1935) reported bovine nasal schistosomiasis in Madras and recorded the presence of *Paragonimus* in dogs. He has also reported on the Canine Schistosomiasis. Fernando (1932) recorded observations on *Mesocoelium* and *Haplorchis* while there are stray contributions by Harshey, Pande, Chatterjee and Gogate.

Cestoda

The work on this group of helminths was taken up by Southwell (1911), who gave a careful account of the Cestodes from fishes and birds in a series of interesting memoirs. Southwell and Prashad (1917-18) reported upon a large number of fish Cestodes and have further sommarised the methods of asexual and parthenogenetic reproduction in Cestodes. Southwell and Hornell have suggested the great possibility of pearl formation in Ceylon pearl oysters owing to the presence of the larval *Tetrarhynchus*, and further, suggested the encouragement of the growth of these larvae for increasing pearl yield in oysters. Thus, although helminth parasites are generally regarded as harmful creatures, this aspect of their studies indicates their usefulness in the economy of nature and her products. His volume on the Cestodes (1930) in the Fauna of the British India summarise our knowledge of the group in India. Meggitt (1920-35) has added considerably to our knowledge of the Indian Cestodes. His contributions are chiefly on the systematics and the life histories of the Cestodes from a variety of hosts, but his work (1934) on the Host-Specificity Theory is specially interesting and deserves consideration. In this memoir he has amply justified his belief in the futility of such a recognition in Cestodes. Recent work by other investigators in India on other helminth groups further strengthens his views. By his careful and continued efforts, he has materially helped Helminthology in India by the establishment of a well-equipped Helminthological Institute at the University of Rangoon. Sondhi (1923) described a number of tapeworms from dogs in the Panjab, and Agarwala (1925) reported an uncommon seat for *Echinococcus* cysts in sheep. Woodland (1923-26) recorded his observations on *Caryophyllaeidae*

and considered this group primitive as against the belief of Loennberg and others who regard it to have been secondarily monzootic. He further showed the affinities of the group with *Gyrocotylidae*. Moghe (1925) recorded his observations on a new species of *Monopylidium* and later (1925 and 1933) described certain Cestodes from birds and Reptiles of India. Verma (1926 and 1928) contributed on the family *Proteocephalidae* and on the order *Tetraphyllidea* by the addition of new forms under each. Gulati (1929) gave an account of new species of Cestode genus *Dipylidium* and Johri (1931-35), originally from Lucknow, has made important contributions on the Cestode fauna of birds from Lucknow and Burma. Inamdar (1933-34) reported on a few species of Cestodes from Indian birds. Malkani (1933) has made experimental investigations on the evagination of the scolices of the larval tapeworms and finds that the surface tension plays an important part in the process. The recent discovery of *Echinococcus* cysts at Lucknow by Thapar (1936), simulating *Coenurus* cysts is rather interesting and some further observations are also collected on this important group.

Nematoda

The work on Nematology has chiefly been conducted by medical investigators who confined themselves mainly to the pathogenic forms in man, and here we find such important workers as Lane, Stewart, Brahmachari and Maplestone. Through their constant efforts, considerable data have accumulated on Ancylostomiasis, Ascariasis, and Filariasis. Work on similar lines has also been done through the generosity of the Rockefeller Foundation by Kendrick and others. Sheather (1919) described a nematode causing parasitic gastritis in calves and later (1920) gave an account of *Syngamus laryngeus* in cattle. Boulenger (1920-21) described a number of nematodes from the domestic animals in the Panjab and Ware (1924) reported two nematodes from the Indian elephants and later from the cattle. Korke (1924) described a new microfilaria from a dog and also redescribed Rudolphi's type species of *Spirocerca*. Chandler (1925) recorded his observations on several forms from the animals dying at the Calcutta zoo. Thapar (1921-25) made some observations on the genus *Kiluluma* describing several new species and further discussed points of general interest in Nematodes. He modified Goodey's formula on the relation between the spicules and the vagina to make it more generally applicable to the members of the group in the following terms: —

« The length of the spicule ordinarily varies with the length of the vagina and where this relationship does not hold good it will be found that the length of the spicule varies with the length of the vagina and its horn taken together ».

This formula is useful in the isolation of the species from each other. Again, while describing the genus *Echinopharynx*, Thapar (1925) showed the presence of rose-thorn-shaped spines in the oesophagus and also indicated the presence of intestinal diverticula in the genus, a feature in which

it was shown to resemble certain members of the family *Ascaridae*. In the Reptilian Oxyurids, Thapar (1925) demonstrated the presence of external ciliation guarding the excretory pore of certain forms and indicated that the group is not primitive as was believed by Seurat and others but that it is a group of highly specialised nematodes that have secondarily attained simplicity through degeneration. He also cleared up the confusion that existed between the two genera, *Tachygonetria* and *Thelandros*, by pointing out that the difference lies mainly in the characters of the genital papillae. A new family, *Labiduridae*, was also reported by him in the same communication. Barsikar (1925) reported a few cases of the occurrence of guinea-worm in domestic animals from Sholapur and Islamabad in the Bombay Presidency. Mirza (1929) demonstrated the absence of uterine connection with the intestine in *Dracunculus medinensis*. The digestive system in these worms, according to Mirza, is greatly degenerated. He has added to our knowledge of the anatomy of these worms, by comparing them with *Ascaris* and *Ichthyonema* (= *Philometra*). Besides, Mirza and his colleagues (1930-36) at Aligarh have described a number of new Nematodes from Indian hosts. A new genus, *Diserratosomus*, was described in 1933 from mongoose. This form, Mirza claims to be a connecting link between Nematodes and Acanthocephala but it needs confirmation. Maplestone (1929-31) recorded valuable results on the Nematodes of pig and on the nematodes of the animals dying at the Calcutta zoo. He redescribed *Wuchereria bancrofti* and considered papillae to be pedunculated. Transverse striations in the pre-anal region of the male were also mentioned. Karve from Nagpur described a few forms from Reptiles and Bhalerao (1932-35) from the domestic animals. All these results reveal that much revision work is needed on the reports received from the European investigators, as some of their findings are necessarily defective in many ways. Anant Rao (1923) described the morphology and life history of *Filaria recondita* from Madras, while Pandit, Pandit & Iyer (1929) describe a new filarid worm, *Conispiculum guindiensis*, from *Calotes*. Baylis (1922-23) reported on the Nematode materials sent by the authorities of the Zoological Survey of India and has recently (1936) summarised our knowledge of the Nematoda in a volume in the Fauna of British India series. The important discovery by Datta (1933) regarding the presence of larvae of *Habronema muscae* in « Barsati » of equines is very interesting as this disease was considered to have been of mycotic origin. This opens up further lines of enquiries on the diseases of domestic animals.

Acanthocephala

Very little work has been done on this interesting group of worms in India and our résumé here indicates a promising future, particularly in the evolution and consequent establishment of a Natural System of Classification for the group. Thapar (1927) described a genus, *Acanthogyrus*, from *Labeo rohita* and advanced a tentative classification of the group, which, according to him, would satisfy a large number of cases. The previous classifications were defective and were criticised by a number of investigators. The characters discovered by Thapar formed a good basis for the divisions of the group. Van Cleave (1928) reported on a collection of Acanthocephala from the Indian Museum

and independently erected two families, *Pallisentidae* and *Hebesomidae*, on one of the two characters indicated by Thapar. Verma (1929) from Allahabad described a genus, *Acanthosentis*, from Calcutta fish, and Subramanian reported a number of forms from Burma. Thapar (1930) described another genus, *Farzandia*, from a fish and further confirmed his earlier belief in the characters of classification given by him.

The value of Thapar's characters in the classification of Acanthocephala have received attention by Western workers and their results lend further support to his views. Bhalerao (1931), Datta (1928-36) and Potdar (1937) have also added to our knowledge of the group.

Thapar (1937) in reviewing certain aspects of helminthology in India has pointed out the existing defects in the text-book teaching of the subject in India, and has suggested the application of accurate nomenclature and substitution of the types in the helminthological studies at our Universities and Colleges. He has again emphasized the value of cooperative work by different departments in combating helminthic infections in India. A zoologist, with his knowledge of comparative anatomy, will be better able to help a physician, a sanitarian, a veterinarian and an agriculturist in the solution of many such problems.

Finally, mention must be made of the recent financing of a scheme at Lucknow for the systematic investigations of the helminthic infections of the domesticated animals in India by the Imperial Council of Agricultural Research. The results of these investigations are likely to be useful to Agricultural India. One thing, however, is definite, that although Burma is equipped with an up-to-date Helminthological Institute, separation of Burma will not materially affect our progress of Helminthology in India. We have several young and enthusiastic workers engaged in active research in the country and their labours are likely to yield fruitful results.

On parasitic Trematodes in Echinoderms

Jean Timon-David
University of Marseilles—France

[With 3 text-figures]

Parasitic Trematodes in Echinoderms remained during a long time pretty nearly unknown. and their life-history is still nowadays scarcely studied. I have put together in this paper the main points of the notions discovered by the few authors who specialized in this branch of Science, and also the outcomes of my own investigations.

Some Echinoderms only, can be final hosts for Trematodes; this occurrence is very rare (*Cleistogamia*). Most frequently, Echinoderms are intermediate hosts (second hosts); and, in fact, some larvae (metacercariae) are very frequently found into *Echinidae*.

Studies on parasitic Trematodes of Echinoderms were made by Schneider (1858), Cuénot (1892), Jacquème (Manuscript), Oshima (1911), E. C. Faust (1924), Ward (1933), Timon-David (1933-1936).

According to the nature of their development, following groups of Parasites are distinguishable:

I — Parasitic metacercariae living into Echinoderms and developing, later on, into sea birds.
II — Metacercariae developing into Fishes.
III — Metacercariae whose life-cycle is unknown.
IV — Mature Trematodes parasitic in Echinoderms.

I

METACERCARIAE DEVELOPING INTO SEA BIRDS

We ove to Cuénot (1892), the knowledge of these parasites. The metacercaria of *Himasthla leptosoma* (Creplin) (*Echinostomidae*) was discovered by this author in perioral tentacles of *Leptosynapta inhoerens* (O. F. Müller), at Arcachon. Cuénot considered this species as identical with the larval stage described by Villot (1879) in the foot of the Lamellibranch *Scrobicularia tenuis*. The cysts lay near the outer surface of the tentacles, and their wall is divisible into two layers: the outer one, thick though transparent, and the inner one thin and refracting. The oral table is provided with a row of 31-32 hooks; the excretory system is of the pattern of *Echinostomidae*. Cuénot did not give any sketch of this metacercaria. An identical form found by Villot in *Scrobicularia* is able to become adult into coast Charadriforms as *Tringa variabilis* Temm. and *Calidris leucophoea* (Pall.). These birds can easily swallow the Synapts at lower water.

From a general stand point, it is curious to find the same metacercaria encysted both in Lamellibranch and Echinoderm. It would be interesting to find out if these two forms do not differ by any particulars in the excretory system.

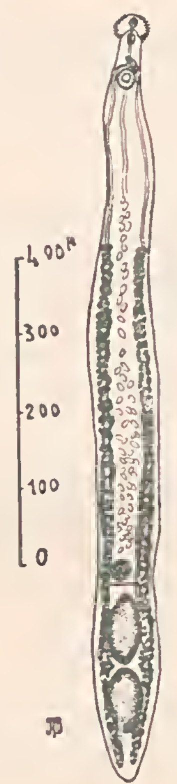


Fig. 1 — *Himasthla leptosoma* (Creplin); *(Echinostomidae).* Mature form from *Tringa variabilis* Temm.

A. Palombi gave a description of a nearly allied species, coming from the bay of Neapel. *Metacercaria (Himasthla) ambigua* Palombi (1934). With *Himasthla secunda* Nicoll, these are the three larval stages of *Himasthla* described till now. Very likely, the localisation of *Himasthla leptosoma* in Holothuries constitutes an exceptional habitat. Nevertheless, the growing of this metacercaria in sea birds is not doubtful.

II

METACERCARIAE DEVELOPING IN FISHES

In a rather ancient manuscript (that was unfortunately never published*), C. Jacquème has mentioned a cercaria encysted in the mouth-muscles of

* Mentioned by H. Caillol and A. Vayssière in : Les Bouches du Rhône. Encyclopédie départementale (1914).

sea-urchin; its description, only grounded on some superficial characters, remains silent about the anatomical structure. I took up again these researches with a plenteous material, (1933-1934), and I discovered two species of metacercariae encysted in sea-urchins. It is difficult to say which of them was seen by Jacquème. According to its peculiar anatomy, I could identify one of them with *Zoogonus mirus* Looss, 1901. Besides, experimental contaminations proved that this determination was quite correct (1936). I have described the second species under the name of *Metacercaria psammechini* Timon-David, 1934; its systematical affinities are still not secure; however, no doubt remains about its growing into a fish.

Metacercaria of Zoogonus mirus Looss, 1901.

I have found very frequently (50 to 60 %) the metacercariae of *Zoogonus mirus* in *Paracentrotus lividus* from the bays of Marseilles and Banyuls. The number of cysts in each sea-urchin is very variable (1 to 60). The same parasite lives in *Sphaerechinus granularis* and *Arbacia aequituberculata*; it seems to be less common into this latter.

Cysts removed from various muscles of the dental apparatus measure 0.25 mm. in diameter; they enclose a coiled hook shaped larva. I have given its anatomical description and I have also studied its life-history.

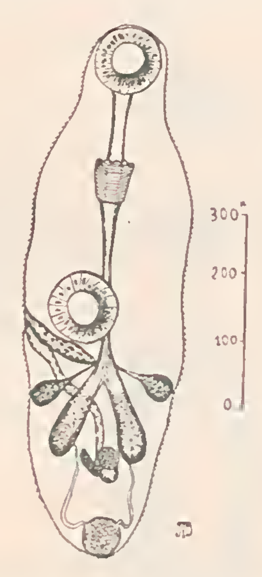


Fig. 2 — *Zoogonus mirus* Looss. Excysted metacercaria from *Paracentrotus lividus*. Bay of Marseilles.

This excysted metacercaria is 0.6 mm. long; its structure is that of the *Zoogonus* genus: spined cuticula; oral sucker 0.09 mm. in diameter; acetabulum 0.1 mm., almost in the middle of the body, near the genital pore; digestive system with a long prepharynx, a large basket-form pharynx and a very long oesophagus which bifurcates after the acetabulum into two short

swelling coeca. Two symmetrical testes situated behind the acetabulum; from each of them runs forwards a vas deferens, delineating an inverted V; the cirrus sac is large; ovary spherical (0.04 mm.), placed between the coeca; near it are the single vitellin follicle and the seminal receptacle. The uterus is not quite grown; it runs a short way forwards the genital pore. Excretory system with spherical vesicle (0.06 mm.) containing concretionary bodies, in which fall the two collecting ducts.

This larva differs from the adult parasite which Looss (1901) and Goldschmidt (1902) described, only by the unactivity of the reproductive system and the incomplete development of the uterus.

Various *Blennius gattorugine* Brün. were experimentally infected by feeding them with encysted metacercariae. These fishes, when autopsied, (45 days after infection), dave twelve *Zoogonus mirus* which were well living, but not yet sexually mature. It appears that *Blennius* being not its regular host is incompletely suitable for this parasite. In the nature, *Zoogonus mirus* was found, till now, only in the rectum of *Labrus merula* L.

Metacercaria psammechini Timon-David, 1934.

I never found this metacercaria in *Paracentrotus lividus*, but I got it frequently in *Psammechinus microtuberculatus* and, less often, in *Sphaerechinus granularis*, from Marseilles and Banyuls.

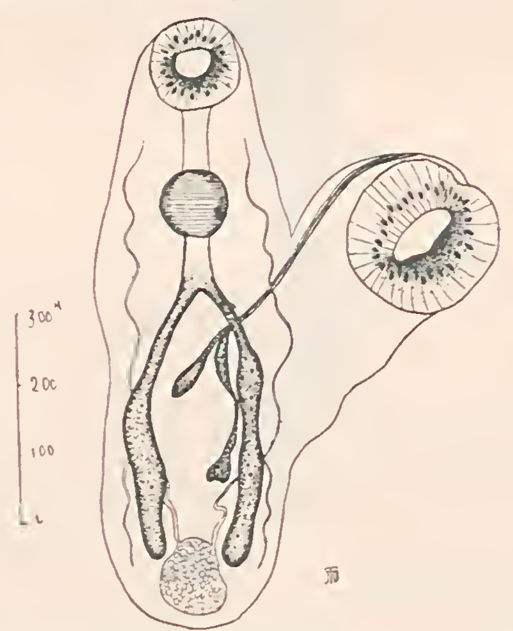


Fig. 3 — *Metacercaria psammechini* Timon-David. Excysted from *Psammechinus microtuberculatus*. Bay of Marseilles.

Cysts removed from the mouth muscles are 0.32 to 0.35 mm. long; their wall is 0.009 mm. thick. Excysted larva is 0.53 mm. long. Acetabulum

(diameter 0.2 mm.), large and pedunculated; oral sucker 0.1 mm. in diameter; digestive system with short prepharynx, very large pharynx (0.072 mm.) and very short oesophagus; elongated coeca, extending almost towards the end of the body. Outlines of the gonades scarcely indicated and besides little grown, placed one above the other, between the coeca; genital pore opens on the front margine of the acetabular foot. Excretory system with an irregularly oval vesicle, (0.1 mm. long), into which open the two collecting ducts. I can't say the number nor the places of the flame cells.

Systematic place of this metacercaria is yet doubtful; the solution of this problem shall be given only by feeding experiments. Unfortunately, my attempts to experimental contaminations were not, till now, efficient. Attribution to a genus from the family *Steringophoridae*, which I proposed (1934) as very hypothetical is not to be maintained.

III

METACERCARIAE FOUND IN ECHINODERMS AND WHOSE LIFE CYCLE IS UNKNOWN.

I shall class first in this provisional group the metacercaria which Anton Schneider (1858) found at Neapel in the coelom of *Holothuria tubulosa* Gm.; its description is besides insufficient.

Metacercaria capriciosa (Cuénot 1893) was found at Roscoff in the gonades of *Ophiothrix fragilis* (Abild.) and of *Ophiura albida* Forbes., and also in the perioral tentacles of *Leptosynapta inhoerens* (Müller). Cuénot's already ancient work, contains a description which is somewhat insufficient: Cysts from 0.1 to 0.2 mm. in diameter; encysted larva with striated cuticula, two large suckers, the acetabular one being a little larger than the oral. Nothing is known on excretory, digestive and genital systems. This larval stage seems very likely to be connected with *Metacercaria megacotyle* Villot, from the *Mysis* of Roscoff.

Cuénot thought (loc. cit., p. 10), but without proofs, that this larva is able to grow into a fish (*Solea, Pleuronectes*), as well as into a sea bird; an opinion which seems very improbable. As long as the anatomical structure of this metacercaria will remain so badly known, it seems to me better to keep back every hypothesis about its development.

In this group must be also classed the metacercaria found by Oshima (1911) in an *Auricularia.*

IV

MATURE TREMATODE PARASITES OF ECHINODERMS

A quite remarkable type was discovered by E. C. Faust (1924) in the intestinal duct of an Holothuria from Andaman Islands, *Actinopyga mauritiana*, which this author named *Cleistogamia holothuriana* (nov. gen., nov. sp.). About fifty parasites were collected by him.

Here is, according to E. C. Faust, the summary description of this unusual parasite.

Pyriform, measuring 2.1 mm. in length, and 1.1 mm. in breadth, concav ventrally, convex dorsally. Oral sucker 0.083 to 0.1 mm. × 0.110 to 0.140 mm. Acetabulum on the posterior half of the body and constituting a rather complex hold fast organ. Digestive system without prepharynx, with two coeca, extending towards the distal region of the body. Genital system curiously constituted, involving an obligatory self-fertilization (Cleistogamy). Elongated, tubular ovary, irregularly bent. Oviduct connecting with a little ootype. Uterus consisting of a large, thin-walled, blind pouch. Eggs (0.092 × 0.077 mm.) with a long polar filament. E. C. Faust supposes that this filament may serve to the rupture of the blind sac and this allowes the dispersion of the enclosed eggs. Two testes symmetrically placed in front of the anterior margin of the hold fast organ; vasa deferentia running one into the other in a single duct leading to a seminal vesicle, in the posterior part of the body. This organ is connected with a long capillary cirrus turning up and meeting a vagin.

No details of the excretory system have been observed; the life cycle is unknown.

This summary of our knowledges makes the unusual interest of Trematode parasites of Echinoderms quite obvious. It is certain that this group will be increased in proportion as new notions will be discovered; such as it is, it gathers together a series of species very remarkable by their life history, development and anatomical structure.

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Lesões produzidas no homem por Strongyloides. Sobre a "hyperinfection"

C. Magarinos Torres e A. Penna de Azevedo
Instituto Oswaldo Cruz, Rio de Janeiro — Brasil

[Com 9 estampas]

Os nematoides do genero *Strongyloides* Grassi, 1879, tem sido encontrados em diversos animaes (porco, macacos, cão, rato, ophidios, gallinha, etc.), mas a unica especie até agora assignalada no homem, é *S. stercoralis* (Bavay, 1877).

A biologia dos *Strongyloides* é sobremodo interessante, pelas curiosas adaptações que apresenta em sua phase parasitaria. No que diz respeito ao *S. stercoralis*, o seu cyclo evolutivo no hospedador offerece particularidades só recentemente investigadas, e, ainda, em discussão, taes a existencia de uma fórma macha parasita, de vida ephemera (Kreis, 1932, Faust, 1933), e a modalidade abreviada do typo « directo » de desenvolvimento, ligada ao que Faust (1936) denomina « hyperinfection ».

Em duas necropsias registradas na Secção de Anatomia Pathologica do Instituto Oswaldo Cruz, tivemos occasião de observar lesões visceraes do homem associadas á presença de numero consideravel de larvas.

Os casos só despertaram attenção quando por occasião do exame dos córtes histologicos, e, como consequencia, a determinação da especie de *Strongyloides* não poude ser baseada no estudo dos helminthos adultos, tratando-se, presumidamente, do *S. stercoralis* (Bavay, 1877). Numerosas larvas (234, no Caso 2983, e 492, no Caso 3042) foram isoladas das paredes dos intestinos (conservados em solução de formol), e identificadas pelo Prof. Lauro Travassos, a quem agradecemos, e cujo relatorio transcrevemos a seguir.

> « Os Drs. C. M. Torres e A. P. de Azevedo remetteram-me fragmentos de intestino grosso provenientes de duas necropsias (n.os 2983 e 3042), com ulcerações de cerca de 5 a 7 mms. de diametro, repletas de larvas de nematodeos.
>
> Pelo estudo que fizemos do referido material, verificamos que, no n.o 3042, as ulcerações continham um grande numero de larvas na cavidade. O material n.o 2983 apresentava larvas no interior da ulceração, e, ainda, outras introduzidas profundamente nos tecidos, o que difficultava, sobremodo, o seu estudo.
>
> Do material n.o 3042 examinamos cerca de 500 larvas, todas do primeiro estadio (rhabditoides). Do material n.o 2983 examinamos, apenas, cerca de 200 larvas, pois o facto de estarem introduzidas profundamente nos tecidos, tornava difficil a obtenção de exemplares em boas condições para estudo. Estas larvas eram, igualmente, do primeiro estadio.

As larvas, quando isoladas (Est. 3, fig. 1), medem cerca de 318 a 400 micra de comprimento por uma largura maxima de cerca de 18 micra. Esophago typicamente rhabditiforme, medindo cerca de 70 a 90 micra de comprimento total; dilatação anterior, medindo cerca de 32 a 45 micra de comprimento; porção intermediaria ou isthmo, cerca de 12 a 25 micra; finalmente, o bulbo, cerca de 10 a 12 micra de diametro. Anus situado a cerca de 55 micra da extremidade. Cauda conica, terminada em ponta aguda. Identifiquei estas larvas como sendo de *Strongyloides*, provavelmente *S. stercoralis* (Bavay, 1877).

O que se observa no material n.º 3012 pode ser explicado, com facilidade, admittindo-se a existencia prévia de ulceras no intestino grosso, nas quaes se hajam alojado as larvas, mantendo, desse modo, as ulcerações. A explicação é mais difficil, no que respeita o material n.º 2983, em virtude da penetração profunda das larvas do primeiro estadio. A explicação que nos parece mais acceitavel, é a de ter havido uma modificação nas condições do meio intestinal, a qual determinaria a migração erratica das larvas, e consequente penetração profunda nas paredes do grosso intestino.

Procuramos verificar a existencia de larvas do segundo estadio (filariformes), que estivessem realisando um cyclo endogeno. Em cerca de 700 larvas examinadas com minucia, todas eram, seguramente, do primeiro estadio (rhabditiformes). Algumas larvas, por vezes, a um exame superficial, pareciam pertencer ao segundo estadio, mas a consequente observação com grande augmento logo revelava que eram, realmente, larvas do primeiro estadio.

Examinamos, ainda, cerca de 20 córtes histologicos de orgãos do Caso n. 2983, nos quaes existiam numerosas larvas na mucosa, e outras, muito mais profundamente, em plena camada muscular. Nestes córtes pudemos, apenas, identificar, com segurança, duas larvas, situadas na intimidade da mucosa, ambas larvas do primeiro estadio ».

Manguinhos, 3 de Setembro de 1937.

(Assignado) *LAURO TRAVASSOS*

O *Strongyloides stercoralis* (Bavay, 1877) apresenta dois cyclos evolutivos, um asexuado (evolução directa ou parthenogenetica), e outro sexuado (evolução indirecta, desenvolvimento heterogonico).

A fórma intestinal ou parasitaria (fórma strongyloide) é representada, unicamente, por femeas, as quaes medem 2.2-2.5 mm. de comprimento e 34-70 micra de largura.

O *habitat* da femea parthenogenetica, ou, mais provavelmente, hermaphrodita[1], é a porção pylorica do estomago, o duodeno e a porção superior do jejuno, Riva (1892) e Von Kurlow (1902) referindo, comtudo, a sua existencia até o cecum e o colon. Occupando o interior das cryptas da mu-

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[1] Sandground (1926) demonstrou a existencia de spermatozoides na femea parasita.

cosa, ahi deposita os seus ovos (Golgi & Monti, 1886), os quaes medem 50-58 micra de comprimento e 30-34 micra de largura, sendo, em sua maioria, já embryonados no momento da oviposição. Segundo Azkanazy (1900), Oudendal (1926) e outros, o helmintho penetra, frequentemente, no stroma da propria mucosa. Ophüls (1929), ao contrario, acredita que o helmintho habitualmente não penetre na espessura da mucosa.

A sahida dos embryões rhabditiformes, os quaes medem, nessa occasião, 200-300 micra de comprimento e 11-16 micra de largura, effectua-se no interior das cryptas pouco tempo depois da postura, ganhando elles, em seguida, o canal intestinal, sendo lançados no exterior juntamente com as fezes. Nestas, os embryões rhabditiformes crescem, attingindo o duplo ou o triplo das dimensões originaes, transformando-se ou directamente em larvas filariformes ou strongyloides infestantes (evolução directa), ou em helminthos «rhabditiformes» sexualmente maduros de vida livre (evolução indirecta).

Em condições favoraveis de temperatura do solo, a transformação de larvas rhabditiformes (primeira geração) em adultos unisexuados de vida livre (fórmas livres, stercoraes ou rhabditoides) póde realizar-se em 30 horas. Os exemplares femeos de vida livre produzem ovos ferteis dos quaes se originam larvas rhabditiformes (segunda geração). Estas transformam-se, depois, em larvas filariformes ou strongyloides infestantes para o homem atravez da pelle ou das mucosas buccal, esophagiana ou gastrica. A larva filariforme transforma-se em femea parthenogenetica uma vez alcançado o tubo digestivo do hospedador.

Leichtenstern (1898) falla em «autoinfection», sem definir, comtudo, o processo segundo o qual ella se daria.

Gage (1911) identifica larvas «filariformes» de *Strongyloides intestinalis* no escarro de um doente que continha numero consideravel de larvas rhabditiformes nas fezes. A necropsia mostrou areas recentes de bronchopneumonia nos lobos inferiores de ambos os pulmões, a presença de larvas no conteúdo da trachea e dos bronchios e de vermes adultos, ovos e larvas na luz do intestino e nas glandulas de Lieberkühn, e, tambem, de larvas nos espaços e vasos lymphaticos do intestino, bem como na sub-mucosa, muscularis mucosae, tunicas muscular e serosa. Diz esse autor textualmente:

> «It has been suggested by Grassi, and later by Ward, that the direct transformation of rhabditiform larvae into filariform larvae and then back to the parasitic mother worms may occur inside the intestine. The finding of three filariform larvae in a fresh stool from one of my cases would seem to bear this out, but this cannot be a common occurrence, or at autopsy there would be found all the stages between the filariform larvae and the adult worm, which is not the case. The finding of larvae in the sputum in Case I here reported, after the patient had been in bed two months, indicates that he was reinfecting himself. Because of his personal filthiness and the irritation of the skin over his buttocks and back, I thought that the larvae were gaining entrance through the skin at this place, and probably some did. However, the presence of larvae in the lymph-spaces and lymph-vessels of the intestinal wall suggests another plausible explanation — that the larvae pierce the intestinal walls, enter the lymph-stream pass up the thoracic duct into the subclavian vein, thence through the right heart to the lungs, appear

in the sputum and, when swallowed, develop into adult parasites. This idea is strengthened by the fact that some of the larvae in the sputum were young, as shown by the presence of the sexual anlage. In this way a vicious circle is set up and the infection grows steadily worse, and, as the number of worms in the intestine increases, more larvae penetrate the intestinal walls and pass over the route above described ».

Em infecções experimentaes massiças, Fülleborn (1914) verificou que as larvas de *Strongyloides* e de *Ancylostoma* podem passar atravez dos capillares pulmonares para a circulação geral, alcançando, desse modo, os rins e outras visceras.

Yokogawa (1913) encontrou numerosas larvas de *Strongyloides stercoralis* na sub-mucosa, muscular e serosa do grosso intestino e no figado de paciente morto de dysenteria amebiana, sendo a autoinfestação, tambem, admittida por Thira (1921).

Fülleborn (1926) referiu como « autoinfection », a reinfestação atravez da pelle da região peri-anal, de individuos infestados em cujos pellos da margem do anus se teriam abrigado larvas rhabditiformes, posteriormente transformadas em larvas filariformes infestantes.

Nishigori (1928) demonstrou que a auto-infestação do hospedador pode dar-se pela penetração de larvas filariformes atravez da mucosa do colon e por emmigração para os pulmões atravez da circulação venosa visceral e do coração direito, seguindo, depois, o helmintho, o seu percurso habitual até o tubo intestinal. Admitte que a reinfestação interna occorra em tres typos de doentes: (1) os que soffrem de constipação, (2) aquelles cujo conteúdo intestinal não é favoravel á vida do nematoide, e (3) aquelles que apresentam ulcerações intestinaes em cuja profundidade as larvas se possam alojar.

Ophüls (1929), publicando um caso de strongyloidose, diz, textualmente:

« In this disease, autoreinfection takes place constantly by the entrance of filariform larvae through the skin, especially in the region of the anus, or by their invasion of the intestinal wall, usually in the region of the colon and rectum. From the colon and upper part of the rectum, the larvae are carried to the lungs indirectly by way of the thoracic duct, while those that penetrate the lower part of the rectum can reach the lungs directly by way of the lower hemorrhoidal veins. The direct mode is probably the more important one, because on the long indirect way many larvae must be destroyed before arriving in the lungs ».

Fróes (1929 e 1930) observou um caso fatal de estrongyloidose com a presença de larvas rhabditiformes nas fezes, no exsudato pleural do doente e do cadaver, no liquido pericardico e no sangue pulmonar do cadaver. Apenas uma larva com os caracteres de estrongyliforme foi encontrada no liquido pericardico. O intestino, aberto desde o duodeno ao recto, não apresentava lesões ulcerosas, contendo fezes molles, quasi diarrheicas, nas quaes, o exame microscopico revelou quantidade extraordinaria de larvas rhabditiformes do *Strongyloides stercoralis*, em cultura pura. « Foi incontestavelmente o exame de fézes que resolveu definitivamente o problema da identificação das larvas, confirmando a idéa que nos deixára o raciocinio a respeito do caso: De facto, deante da ausencia de ver-

mes adultos no intestino (o que nos deu a certeza de não serem as larvas de ascaride nem de ancylostomo) raciocinámos: — Qual o nematoide intestinal cujas larvas podem circular no sangue e cujos adultos não são visiveis ao ser feito o exame macroscopico das paredes intestinaes? Ao que nos consta isso só se dá de referencia ao *Strongyloides stercoralis* cujos adultos, hermaphroditas (Sandground) vivem nas paredes do intestino delgado, parasitando as glandulas de Lieberkühn ».

Faust e seus collaboradores (1931-35) admittem um cyclo evolutivo algum tanto differente do que é referido pelos classicos.

Faust (1931) assignala a presença de larvas filariformes anãs em fézes recentemente emittidas, de doentes com diarrhéa, desapparecendo ellas, completamente após administração de violeta de gentiana, ao passo que persistem as larvas rhabditiformes.

Faust (1933) confirma a existencia de machos parasitos descobertos por Kreis (1932). Seriam elles mais communs, nos bronchiolos e bronchios nos estadios preadolescente e adolescente, existindo, porém, na propria cavidade do intestino, nos estadios de adolescente e maduro. O seu numero decresce, comtudo, progressivamente, desde o fim do periodo de incubação (6-8 dias) até o 45º dia. De qualquer maneira, a sua permanencia no intestino seria sempre transitoria, não tendo a capacidade de penetrar nos tecidos.

Faust, Wells, Adams & Beach (1934) fornecem dados experimentaes indicando que, positivamente, existe uma auto-infestação interna.

Faust (1933), Beach (1935, 1936), Kouri, Basnuevo e Arenas (1936) mostraram que as chamadas evoluções « directa » e « indirecta » dependem fundamentalmente, das condições do meio ambiente, devendo ser minorado o significado que pudesse ter como typos evolutivos distinctos.

Faust (1936) diz textualmente:

> « Thus both clinical and experimental evidence on the part of several observers has indicated that internal self-infection exists; that it is an abbreviated form of the « direct » type of development adapted to a purely parasitic existence of the parasite; that diarrhea favors this modification in the development and that it is not uncommon either in clinical cases or in suitable experimental hosts. Since this mode of internal reinfection constitutes a definite step in the progressive parasitism of *Strongyloides* and is distinct from external « autoinfection » as conceived by Fülleborn (1926), the writer believes that his consistent use of the term « *hyperinfection* » for this process of internal reinfection is amply justified ».

Caso n.º 2983. — S. F. C., brasileiro, branco, barbeiro, de 31 annos de edade, internou-se, em Março de 1937, na 1.ª Enfermaria do Hospital S. Francisco de Assis, serviço clinico do Prof. Agenor Porto, sob os cuidados medicos do Dr. Garcia Junior. A doença teve inicio em Novembro de 1936, quando, após ingestão de meio litro de leite, ao deitar-se, o paciente foi despertado alta noite, com mal estar e vomitos. Desde a manhã seguinte, installou-se uma diarrhéa que tem persistido até a data de entrada na Enfermaria, com alternativas de melhoras e peoras. As evacuações diarias são em numero de tres ou quatro, as fezes quasi liquidas, amarelladas, não arejadas,

sem muco e sem sangue. O doente apresenta vomitos constituidos por «gosma» verde, ou verde-amarellada. Reserva alcalina egual a 42 %. O exame de urina revela glycosuria e o de fezes mostra numerosissimas larvas de *Strongyloides*.

O obito occorreu 9 dias depois do internamento, sendo a necropsia realisada 17 horas após a morte.

Protocollo da necropsia: — O cadaver é de um homem moço, de côr parda, em más condições de nutrição, medindo 1 m. 67 de comprimento, pesando 58 kilos. Pupillas redondas, egualmente dilatadas, corneas limpidas, conjunctivas pallidas. Dentes em condições regulares de conservação, existindo alguns postiços. Rigidez cadaverica presente. Ganglios lymphaticos inguino-cruraes, palpaveis. Externamente não ha edema, nem ictericia, nem anomalias.

Ao córte, camadas gordurosa e muscular reduzidas. Peritoneo parietal pallido, liso e brilhante. Alças intestinaes livres de adherencias. Gordura do epiploon muito reduzida. Ganglios lymphaticos mesentericos, algum tanto augmentados de volume.

Thorax: — Espaço precordial descoberto em extensão normal, o sacco fibroso do pericardio encerrando 30 c. c. de liquido amarello, turvo. Coração de volume comparavel ao do punho do cadaver, pesando 240 grs. Ponta formada pelo ventriculo esquerdo. Gordura epicardial reduzida. Existe uma placa leitosa sobre a face anterior do ventriculo direito. Ao córte, as paredes do ventriculo esquerdo são augmentadas de espessura, medindo 22 mms. na base. Endocardio parietal e valvular, liso e brilhante. Musculatura um pouco diminuida de consistencia, de coloração vermelha-pardacenta, não mostrando, ao córte, augmento apparente do tecido conjunctivo. Aorta mostra duas pequenas placas, amarellas, proeminentes, pouco acima do orificio aortico, sendo lisa, amarella, brilhante, na porção restante. Pulmões augmentados de volume, pesando o direito, 760 grs., e o esquerdo, 628 grs. A crepitação é diminuida Superficie do córte de côr vermelha-escura, muito humida, dando sahida, pela compressão, a liquido espumoso, sanguinolento. Não ha nodulos, nem areas de consolidação perceptiveis pela palpação.

Baço mede, sobre a convexidade, 12,5 × 7,5 × 4 cms., pesando 258 grs. Capsula conjunctiva, algum tanto espessada. Superficie do córte, de côr vermelha-escura, sendo o tecido conjunctivo mais apparente que o normal, e o lymphoide, obscurecido. A pôlpa não é diffluente. Junto ao baço principal, existe um supranumerario, do tamanho de uma avelã.

Rim direito mede 12,5 × 7 × 4 cms., pesando 160 grs., e o esquerdo, 13 × 4 × 3,5 cms., pesando 170 grs. Em ambos, a capsula é adherente, acarretando porções do parenchyma renal, ao ser destacada. Camada cortical adelgaçada, de côr amarellada. Pyramides de côr violacea.

Figado augmentado de volume, pesando 1900 grs., medindo, o diametro transverso, 29 cms., o antero-posterior, 17 cms., e o vertical, 11 cms. Configuração normal. Capsula lisa, transparente e brilhante. Superficie do córte, de côr pardacenta-rosea, com aspecto opaco, sendo obscurecido o desenho lobular, e esboçado, o aspecto de «noz moscada». Consistencia diminuida.

Vesicula biliar, pancreas e glandulas suprarenaes, sem alterações do normal.

Intestino delgado com a mucosa pallida e brilhante em toda a extensão. No grosso intestino, muito numerosas pequenas ulcerações superficiaes, com menos de 1 cm. de diametro (Est. 3, fig. 1) são encontradas. Algumas, parecendo recentes, de coloração escura, quasi negra, mostram bordos lisos e regulares. Outras, pare-

cendo mais antigas, mostram retracção dos tecidos e contornos irregulares. As ulceras não são recobertas por quantidade apreciavel de fibrina, sendo a sua porção central, em geral, a parte mais profunda. Não existem helminthos reconheciveis a olho nú.

Craneo: — Não foi examinado.

Diagnostico anatomico: — Colite ulcerativa. Lesões associadas á presença de larvas de *Strongyloides* no intestino grosso, veias colicas, veia-porta, figado, ganglios lymphaticos mesocolicos e pulmões. Glomerulo-nephrite aguda (leve). Hypertrophia do ventriculo esquerdo. Petechias na mucosa do estomago. Edema e congestão chronica passiva dos pulmões. Bronchopneumonia hypostatica. Congestão chronica passiva do figado e do baço. Cachexia. Baço supranumerario.

Exame microscopico: — A lesão encontrada, uniformemente, em todos os fragmentos do grosso intestino submettidos a exame microscopico, consta de *infiltração cellular diffusa da mucosa e sub-mucosa*, mais pronunciada na mucosa que na sub-mucosa, variando de intensidade de ponto para ponto. Embora diffusa, permanece sempre discreta. As cellulas encontradas são, em sua maioria, polymorphonucleares eosinophilos (Est. 4, fig. 1), aos quaes se juntam macrophagos e, em menor numero, cellulas plasmaticas e lymphocytos. O processo inflammatorio diffuso está associado á presença de numerosas larvas rhabditiformes de *Strongyloides*, localisadas umas na luz das glandulas de Lieberkühn, geralmente em sua porção mais profunda (Est. 4, figs. 1 e 3), outras no chorium adjacente (Est. 4, fig. 1), outras, ainda, no *muscularis mucosae* ou na sub-mucosa (Est. 2, fig. 2). Não ha formação de fibrina.

O numero de larvas é, por vezes, consideravel. Em determinado preparado, contamos 44 córtes differentes de larvas em 5 millimetros quadrados.

Ás vezes a mucosa não mostra nenhum nucleo corado, nos preparados pela hematoxylina-eosina, em zonas extensas de sua porção superficial, sem desintegração dos tecidos (*alteração post-mortem*) (Est. 1, fig. 2, em sua parte inferior).

Em determinados pontos, a infiltração cellular e tumefacção da mucosa e sub-mucosa são mais accentuadas, o epithelio de revestimento desapparecido, as glandulas modificadas em seu arranjo normal, o *muscularis mucosae* interrompido e tumido, processos esses que traduzem uma lesão ulcerosa em phase inicial de formação (Est. 4, fig. 2).

Outras lesões encontradas nos córtes histologicos do colon constam de suffusões hemorrhagicas, necrose em fócos e verdadeiras ulceras.

As *suffusões hemorrhagicas* associam-se á infiltração cellular diffusa e occupam, ora a parte mais superficial da mucosa (Est. 2, fig. 2; est. 4, fig. 3; est. 5, fig. 1), ora constituem pequenos fócos multiplos, tanto na mucosa, como na sub-mucosa (Est. 2, fig. 2, *b*). As hemorrhagias estão associadas á presença de larvas rhabditiformes de *Strongyloides*.

Necrose circumscripta da mucosa e sub-mucosa (Est. 3, fig. 2), é outro typo de lesão encontrado. Ao seu nivel as lesões existem não só nas tunicas muscular e peritoneal, como extensas no meso-colon subjacente (Est. 3, fig. 2, *c*). Constam de infiltração cellular, associada ou não á presença de larvas rhabditiformes de *Strongyloides*, bem como de thrombose parasitaria parietal (Est. 5, fig. 2) ou obliterante (Est. 6, fig. 1; est. 7, fig. 1) das veias colicas. Abundante material sem estructura apparente, intensamente corado pela eosina (substancia hyalina) existe accumulado na visinhança immediata das larvas que occupam a

luz das veias (Est. 6, fig. 1). Além de thrombose, as larvas dão lugar a um processo de endophlebite e periphlebite, este ultimo bastante intenso quando existe thrombose obliterante (Est. 6, fig. 1).

Nas *ulcerações*, a necrose compromette, egualmente, a tunica muscular, tornando-se bastante adelgaçadas as paredes do intestino ao seu nivel (Est. 3, fig 3).

Junto ás larvas rhabditiformes que penetraram recentemente nas paredes do intestino, as lesões constam de hemorrhagia (Est. 2, fig. 2; est. 4, fig. 3) e infiltração polymorphonuclear eosinophila e lymphocytaria (Est. 1, fig. 1). Em torno das de penetração mais antiga, taes as situadas no fundo das ulceras, dominam os macrophagos (histiocytos) e cellulas gigantes de corpo extranho (Est. 5, fig. 3) existindo, em menor numero, polymorphonucleares, lymphocytos e cellulas plasmaticas.

Os córtes histologicos dos rins mostram glomerulos augmentados de volume, com proliferação de cellulas endotheliaes, proliferação moderada do epithelio da capsula de Bowmann, e adherencias anormaes do glomerulo á capsula. Os capillares do tufo glomerular são, em geral, permeaveis. Completa o quadro histologico, intensa hyperemia (capillares e arterias), edema, processos degenerativos (infiltração gordurosa e degenerescencia hydropica) e necrose no epithelio dos tubos contornados. Existem, ainda, cylindros hyalinos e proliferação do tecido intersticial em fócos circumscriptos. Não ha arteriosclerose dos grossos vasos.

Nos vasos lymphaticos da sub-mucosa do colon, as larvas localisam-se em sua luz. Alguns penetram em suas paredes, collocando-se entre as tunicas media e interna (Est. 6, fig. 2). O endothelio está conservado, notando-se infiltração mononuclear em torno do helmintho. Este e a reacção inflammatoria constituem um pequeno nodulo que faz saliencia na cavidade do vaso lymphatico.

A tendencia das larvas rhabditiformes que caminham ao longo das vias lymphaticas a penetrarem em suas paredes e nos tecidos adjacentes é bem exemplificada nos pequenos ganglios lymphaticos do mesocolon. Na figura 2 da est. 8, vemos larvas localisadas no seio lymphatico marginal, em torno das quaes se constituio um granuloma inflammatorio, no qual as cellulas endotheliaes são elemento dominante. Na (Est. 8, figs. 1 e 3) as larvas abandonaram a luz dos seios lymphaticos, localisando-se nos cordões folliculares. Ahi são circumdadas por cellulas gigantes de corpo extranho, o que confere ao processo de lymphadenite existente, um cunho histologico peculiar.

As larvas são encontradas, egualmente livres, no tecido gorduroso do mesocolon (Est. 8, fig. 4).

Outras lesões interessantes são as que provocam as larvas rhabditiformes de *Strongyloides* no systema venoso. Nas veias do meso-colon, as larvas occupam a sua luz (Est. 5, fig. 2), dando lugar a thrombose parietal (Est. 5, fig. 2), ou obliterante (Est. 6, fig. 1). Na visinhança immediata do helmintho existe uma substancia homogenea fortemente corada pela eosina, com a apparencia de substancia hyalina (Est. 6, fig. 1, *s*). Nas veias com thrombose obliterante (Est. 6, fig. 1) existe um intenso processo de periphlebite. Em algumas veias com thrombose obliterante, a estructura do vaso é reconhecida com difficuldade, as estructuras existentes semelhando um nodulo inflammatorio, em cuja parte central apparecem numerosas larvas e fibrina, esse tecido cor-

responde á luz e ás tunicas interna e parte da media da veia. (Est. 7, fig. 1). A porção externa da media e a adventicia, são as porções ainda reconheciveis como constituintes de um vaso.

No figado, as larvas rhabditiformes penetram nas paredes da veia porta (Est. 9, fig. 1), ahi acompanhadas de infiltração cellular, ou ganham o tecido conjunctivo dos espaços-porta (Est. 9, fig. 2), cercando-se de cellulas gigantes de corpo extranho e de lymphocytos.

As larvas rhabditiformes são achatadas, ainda, no interior dos alveolos pulmonares, juntamente com numerosas hematias (Est. 9, fig. 3).

Caso n. 3042. — No decurso da necropsia de um homem adulto, o Dr. Sylvio Moniz encontrou lesões ulcerativas no grosso intestino, enviando a peça ao nosso laboratorio para estudo.

A peça comprehende o cecum, appendice ileo-cecal, colon ascendente e parte do colon transverso, medindo, ao todo, 65 centimetros de comprimento.

No colon ascendente (Est. 1, fig. 1), a 29 cms. acima do cecum, existem tres pequenas ulcerações situadas em dobras do grosso intestino visinhas entre si. Apresentam dimensões sensivelmente eguaes, medindo 4 × 3 mm. A mucosa mostra aspecto normal no intervallo que as separa, o qual mede, respectivamente, 27 e 21 millimetros. Em duas, o fundo é raso, liso ou recoberto por pequenas particulas de fibrina, os contornos recortados e irregulares (Est. 1, fig. 1, *b* e *c*). Em outra, a superficie ulcerada é recoberta e escondida por abundante material fibrinoso (Est. 1, fig. 1, *a*).

Seis outras ulcerações semelhantes são encontradas no colon ascendente, distando, respectivamente, 8, 16, 23, 25, 78 e 100 millimetros das primeiras. Em geral o seu fundo é liso, mas em algumas, a elle adherem pequenas particulas de fibrina.

Na porção inicial do colon ascendente e, mais adiante, em segmento que se extende de 22 cms. acima do cecum até as primeiras ulcerações, apparecem numerosas pequenas depressões a cujo nivel a mucosa é conservada. As menores e mais numerosas são simples depressões punctiformes, as maiores dando a impressão de ulcerações em via de cicatrisação.

Exame microscopico: — Os córtes histologicos do colon mostram lesões circumscriptas interessando, quasi exclusivamente, as tunicas mucosa e submucosa.

Na porção central da lesão, as glandulas de Lieberkühn estão completamente desapparecidas (Est. 1, fig. 2), o mesmo acontecendo ao *muscularis mucosae*, este é bem reconhecivel nas margens da ulcera, onde as glandulas conservam arranjo normal. Os tecidos do fundo da ulcera são formados pelo *stroma* da mucosa em via de desintegração e pela sub-mucosa. O *stroma* dilacerado, mostra edema, infiltração por lymphocytos e polymorphonucleares, e contem numerosos capillares e pre-capillares fortemente dilatados, contendo hematias, fibrina e numerosas bacterias.

Na porção central do fundo da ulcera, a sub-mucosa apresenta degenerescencia hyalina das fibras collagenas. Estas apparecem tumidas e coradas de modo homogeneo, em roseo, pela eosina, constituindo uma area circumscripta, immediatamente subjacente á mucosa dilacerada. A infiltração por cellulas inflammatorias é discreta nessa zona, sendo mais intensa na zona profunda onde a sub-mucosa apresenta edema. As cellulas dominantes são lymphocytos e macrophagos, a infiltração tendo, por vezes, disposição perivascular.

As tunicas muscular e serosa apresentam estructura quasi normal ao nivel da ulceração. A unica alteração consta de infiltração mononuclear peri-vascular, e essa mesma, em um ou outro ponto da camada de fibras circulares da tunica muscular.

É justamente, em espaços claros (Est. 1, fig. 2) existentes no *stroma* desintegrado da mucosa, e em outros que separam tal *stroma* da sub-mucosa inflammada e com estructura compacta, que se encontra notavel quantidade de larvas de *Strongyloides* (Est. 1, fig. 2 *a*).

No interior de glandulas de Lieberkühn (raras) da visinhança da ulcera apparecem larvas occupando, simplesmente a luz glandular, sem provocar, apparentemente, nenhuma lesão. Não foram achadas femeas hermaphroditas nos córtes histologicos.

Nenhuma larva foi encontrada na espessura das paredes do intestino.

Estudo helminthologico: — Duas lesões ulcerosas foram retiradas da peça e enviadas ao Prof. Lauro Travassos para estudo. Raspando a superficie das ulceras, sem dissociar os tecidos, Travassos retirou 492 larvas de *Strongyloides*, provavelmente *stercoralis* (Bavay, 1877), as quaes eram todas larvas do primeiro estadio.

É facto significativo o de nenhuma larva filariforme ter sido encontrada, embora cuidadosamente buscada.

DISCUSSÃO E CONCLUSÕES

As larvas de primeiro estadio, ou larvas rhabditiformes de *Strongyloides* parasito do homem, tem a capacidade de penetrar e de emigrar nas paredes do grosso intestino, atravessando as tunicas muscular e peritoneal, ganhando os vasos sanguineos colicos, o plexo lymphatico sub-seroso, ganglios lymphaticos mesocolicos, figado e pulmões do homem.

Verificamos, porém, que esse facto não occorre *de modo constante*, mesmo quando existem lesões ulcerosas. Assim, no Caso 3042, embora as lesões ulcerosas contivessem notavel quantidade de larvas rhabditiformes, nenhuma era vista penetrando nas porções não ulceradas das paredes do intestino. Ao contrario disso, em outro Caso (n.º 2983), tambem com lesões ulcerosas, a penetração de larvas do primeiro estadio effectuava-se em quantidade consideravel, com disseminação posterior dessas larvas, *sempre com a morphologia de larvas no primeiro estadio*, pelas veias colicas, veia-porta, lymphaticos do meso-colon, figado e pulmões.

Nos dois casos que observamos existiam, concomitantemente, lesões ulcerosas numerosas, embora de pequenas dimensões, ao longo de todo o grosso intestino [2]. O estudo microscopico revela, porém, que a penetração se effectua, em larga escala, em pontos não ulcerados das paredes do intestino.

As causas determinantes do phenomeno permanecem obscuras, mas não estão ligadas a um supposto cyclo «directo» de desenvolvimento («hyper-

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[2] No interessante caso publicado por Fróes (1930), larvas rhabditiformes foram encontradas no liquido pleural do doente e do cadaver, e no liquido pericardico e sangue pulmonar do cadaver. O intestino, examinado desde o duodeno até o recto, não mostrava ulcerações; as fezes continham quantidade extraordinaria de larvas rhabditiformes de *Strongyloides stercoralis*, em cultura pura.

infectiou»), no sentido de Faust (1936). Com effeito, nenhuma larva strongyliforme poude ser demonstrada em fragmentos do intestino, quer raspados, quer dissociados, embora 726 larvas houvessem sido, cuidadosamente, identificadas por helminthologista competente. Travassos lembra a possibilidade do meio ambiente ter-se tornado. momentaneamente, desfavoravel ás condições de vida do helmintho, o qual procura, então, abandonal-o apressadamente (instincto de conservação da especie), phenomeno que encontra analogia com o que acontece em relação a outros nematodios, especialmente o *Ascaris lumbricoides*.

Não foi possivel excluir, em nosso material, a hypothese de se tratar de especies differentes de *Strongyloides*. Achamos, com effeito, que a identificação da especie de *Strongyloides* não pode ser feita, unicamente, pelo exame das larvas. Outros casos existentes na litteratura, e, nos quaes, tambem, não puderam ser examinados exemplares adultos de *Strongyloides*, estão nas mesmas condições que os nossos: dizem respeito, *presumidamente*, a larvas de *Strongyloides stercoralis* (Bavay, 1877).

A identificação das larvas rhabditiformes em material retirado do intestino fixado em formol. não é feita facilmente. A confusão entre larvas rhabditiformes e strongyliformes, impossivel de se dar em material examinado a fresco, não é difficil de occorrer em material nas condições acima indicadas, especialmente se o examinador não for helminthologista experimentado.

A distincção entre larvas rhabditiformes e strongyliformes pode ser realizada, theoricamente, em córtes histologicos de material incluido em paraffina, mas, na pratica, geralmente não pode ser levada a effeito. pela difficuldade de se obter um córte histologico longitudinal do pharynge da larva. Em material tão rico como o do Caso 3012 (Est. 5, fig. 3; est. 7, fig. 1; est. 8, fig. 1), Travassos só conseguio effectual-a em duas larvas, ambas rhabditiformes.

Figuras apparentemente identicas ás que representamos agora (Est. 8, fig. 4; est. 9, figs. 2 e 3) existem referidas na litteratura, como larvas filariformes ou strongyliformes de *Strongyloides*. É muito provavel que ellas representem, na realidade, larvas rhabditiformes daquelle helmintho, conforme ficou apurado no nosso material.

O histotropismo ou emigração activa de larvas rhabditiformes de *Strongyloides* para os tecidos do homem dá lugar a processos pathologicos definidos.

No grosso intestino, as larvas determinam uma infiltração cellular diffusa da mucosa e sub-mucosa, a qual é tanto mais intensa quanto maior o numero de larvas encontrado, bem como suffusões hemorrhagicas, necrose em fócos e verdadeiras ulceras (Est. 2, fig. 2; est. 3, figs. 2 e 3; est. 4, figs. 1-4; est. 5, fig. 1).

As glandulas de Lieberkühn podem ser a via de accesso seguida pelas larvas, antes de se intrometterem na espessura das proprias paredes do intestino. São encontradas, assim, larvas alojadas na extremidade profunda das glandulas (Est. 4, figs. 1 e 3), e outras, no chorium circumvisinho (Est. 4, fig 1) infiltrado por polymorphonucleares eosinophilos (Est. 4, fig. 4, *e*) e lymphocytos.

Larvas rhabditiformes podem ser encontradas livres nos tecidos do mesocolon (Est. 8, fig. 4). O maior numero, porém, é encontrado no interior de pequenas veias, dando lugar a thrombose parietal e obliterante, acompanhada de peri-phlebite (Est. 5, fig. 2; est. 6, fig. 1; est. 7, fig. 1) ou no de vasos

lymphaticos (Est. 6, fig. 2) e ganglios lymphaticos mesocolicos (Est. 8, figs. 1-3).

A infiltração cellular por leucocytos polymorphonucleares eosinophilos, caracteristica das helminthoses, apparece, com nitidez, no tecido sub-peritoneal, na visinhança immediata de veias com phlebite e periphlebite associada á presença de numerosas larvas.

Nos pequenos ganglios lymphaticos meso-colicos, contidos no tecido subperitoneal, as larvas abandonam os seios lymphaticos e penetram, em grande numero, nos cordões folliculares. A lymphadenite adquire aspecto histologico peculiar, em virtude de numerosas cellulas gigantes de corpo extranho, se formarem em torno das larvas (Est. 1, figs. 1 e 3). Estas, enclausuradas no tecido lymphoide, de modo permanente, são votadas a uma segura destruição, tal como é a regra em parasitos erraticos.

No figado, as lesões são circumscriptas á visinhança das larvas, constando de infiltração cellular do estroma conjunctivo e formação de cellulas gigantes de corpo estranho, em contacto com a larva enclausurada (Est. 9, fig. 2). Quando situada na espessura das paredes da veia-porta, a larva é circumdada por lymphocytos, macrophagos e leucocytos eosinophilos (Est. 9, fig. 1).

A presença de larvas rhabditiformes livres na luz dos alveolos, acha-se associada á de numerosas hematias e liquido edematoso (Est. 9, fig. 3).

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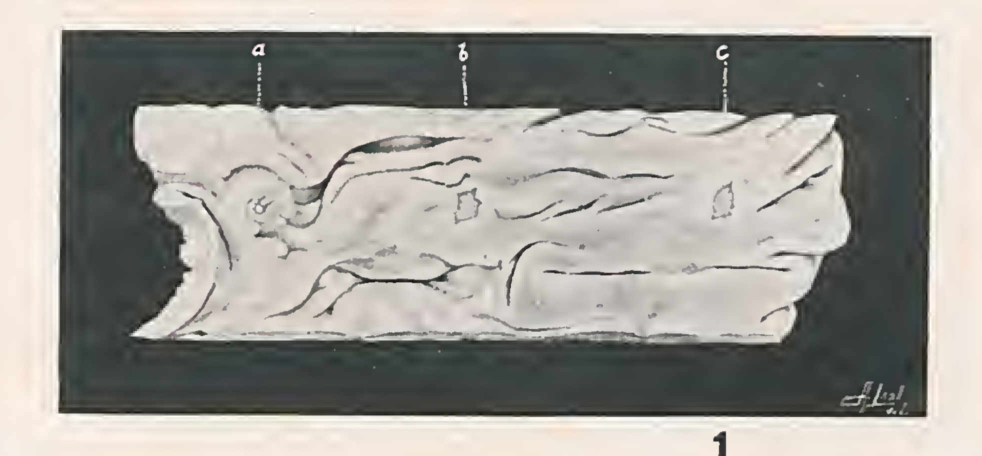
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Estampa 1

Fig. 1 — Lesões ulcerosas no colon ascendente do Caso n.º 3012, as quaes abrigavam notavel quantidade de larvas rhabditiformes de *Strongyloides* sp. Raspando a superficie de duas ulceras, foram colhidas 492 larvas, todas do primeiro estadio (Travassos).

Fig. 2 — Preparação histologica de ulcera do colon, no Caso n.º 3012. Em intersticios da mucosa e sub-mucosa necrosadas, numerosas larvas rhabditiformes (*a*) de *Strongyloides*. Degenerescencia hyalina das fibras collagenas em porção que constitue o fundo da ulcera. Tunicas muscular e peritoneal integras. Nenhuma larva existe em porções não necrosadas das paredes do intestino, neste doente.



1



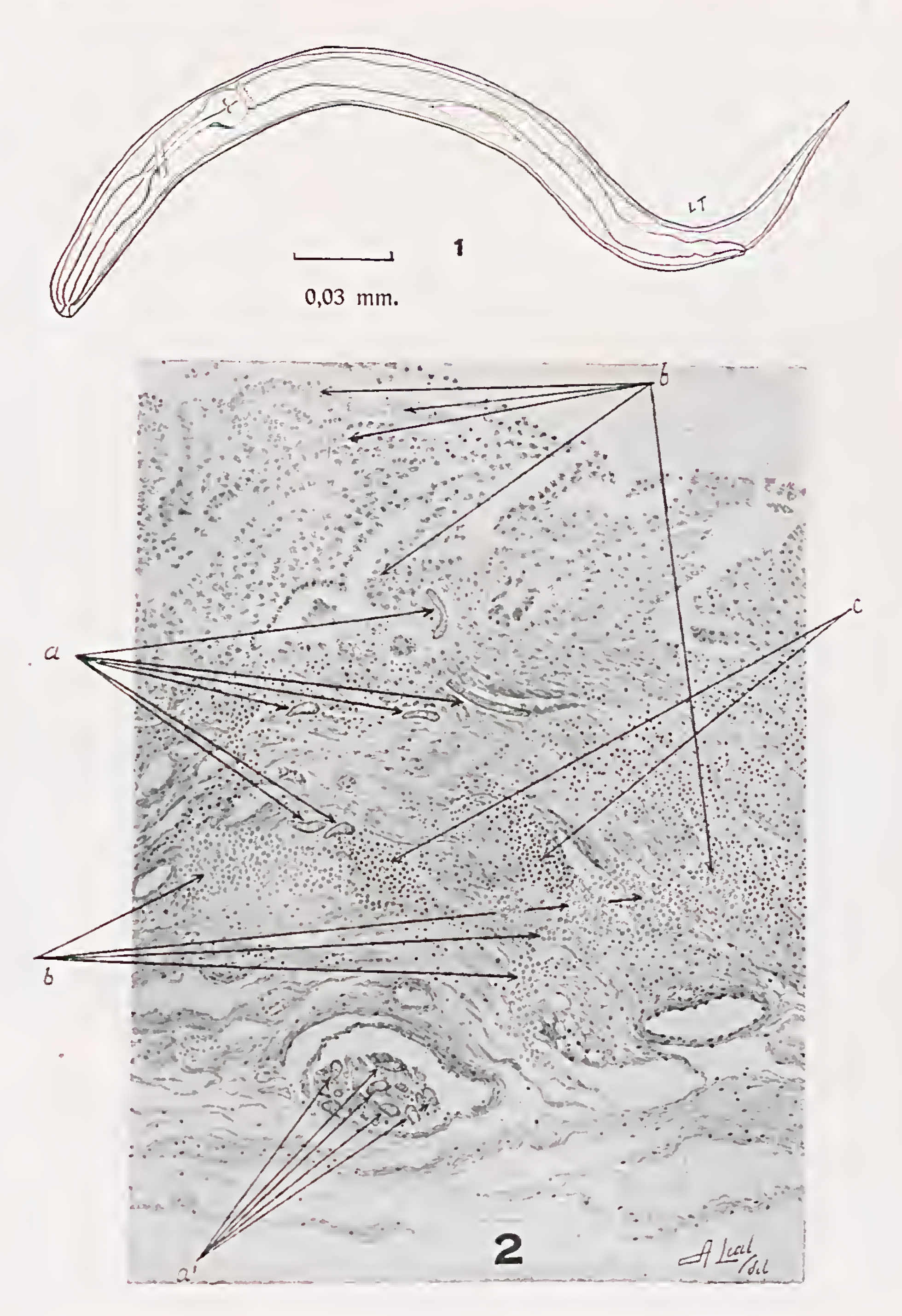
2

Torres & Azevedo: Lesões produzidas no homem por *Strongyloides*.

Estampa 2

Fig. 1 — Larva rhabditiforme de *Strongyloides* sp., segundo L. Travassos, retirada de ulcera do intestino do Caso n.º 3042.

Fig. 2 — Preparação histologica do colon do Caso n.º 2983. A mucosa não está destruida. Suffusões hemorrhagicas (*b*), na mucosa e na sub-mucosa. Numerosas larvas rhabditiformes de *Strongyloides*, tanto na mucosa e sub-mucosa (*a*), como na luz de veias colicas (*a'*). Infiltração por polymorphonucleares eosinophilos e mononucleares (*c*), na visinhança das larvas.



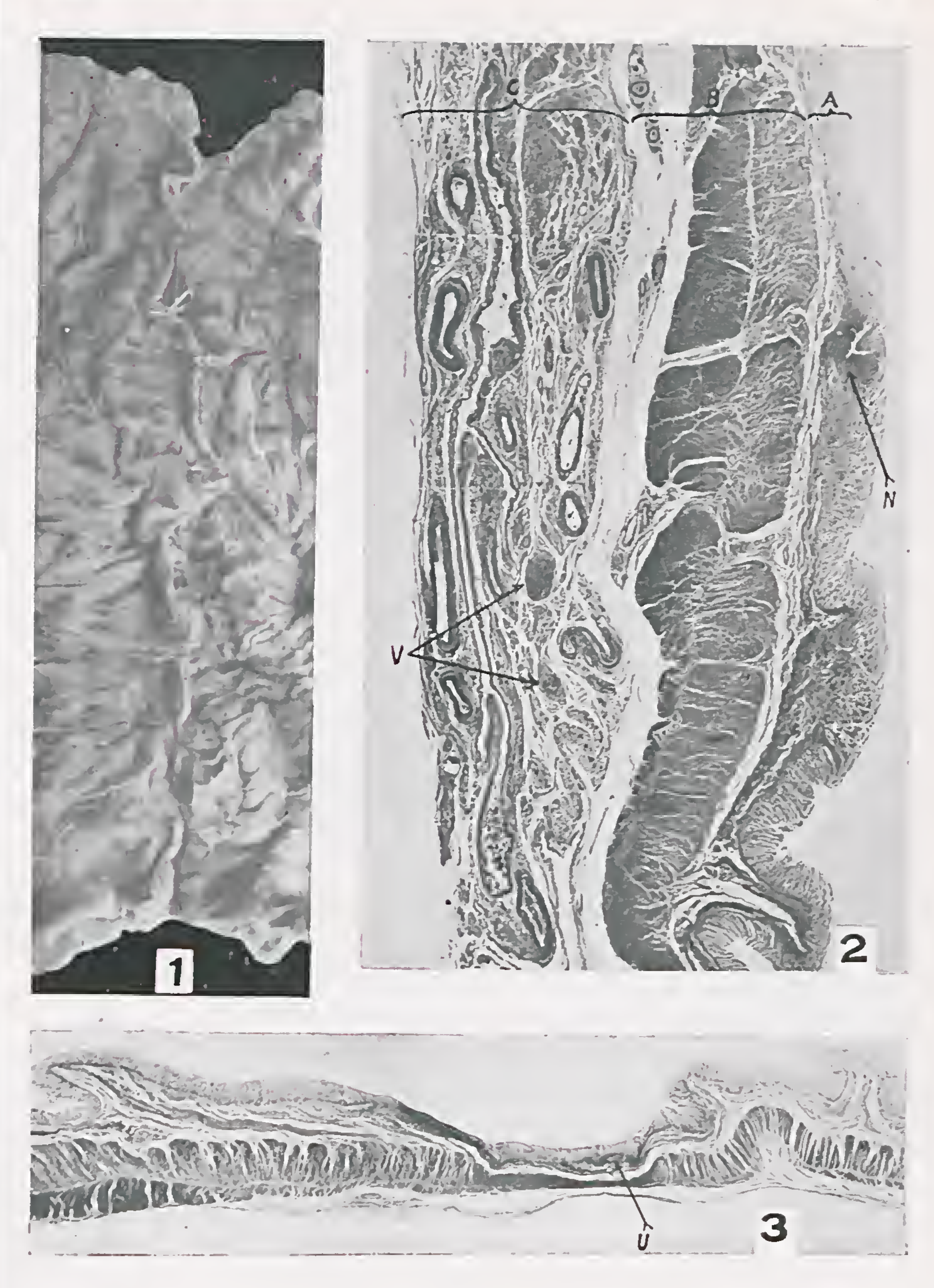
Torres & Azevedo: Lesões produzidas no homem por *Strongyloides*.

Estampa 3

Fig. 1 — Lesões ulcerosas no grosso intestino do Caso n.º 2983. Notavel quantidade de larvas rhabditiformes de *Strongyloides* sp. são encontradas na superficie das ulceras e na espessura das paredes do intestino, tanto nos pontos ulcerados como em porções não ulceradas.

Fig. 2 — Grosso intestino do Caso n.º 2983.
A, mucosa e submucosa. *B*, tunicas muscular e peritoneal. *C*, mesocolon. *N*, necrose circumscripta da mucosa e sub-mucosa. *V*, veias mesentericas, com thrombose e numerosas larvas de *Strongyloides* (Est. 6, fig. 1, com maior augmento).

Fig. 3 — Grosso intestino do Caso n.º 2983. Ulcera (*U*), cujo fundo apresenta tecido de granulação (v. Est. 5, fig. 3) contendo numerosas larvas de *Strongyloides*. Adelgaçamento da tunica muscular, ao nivel da ulcera.



Torres & Azevedo: Lesões produzidas no homem por *Strongyloides*.

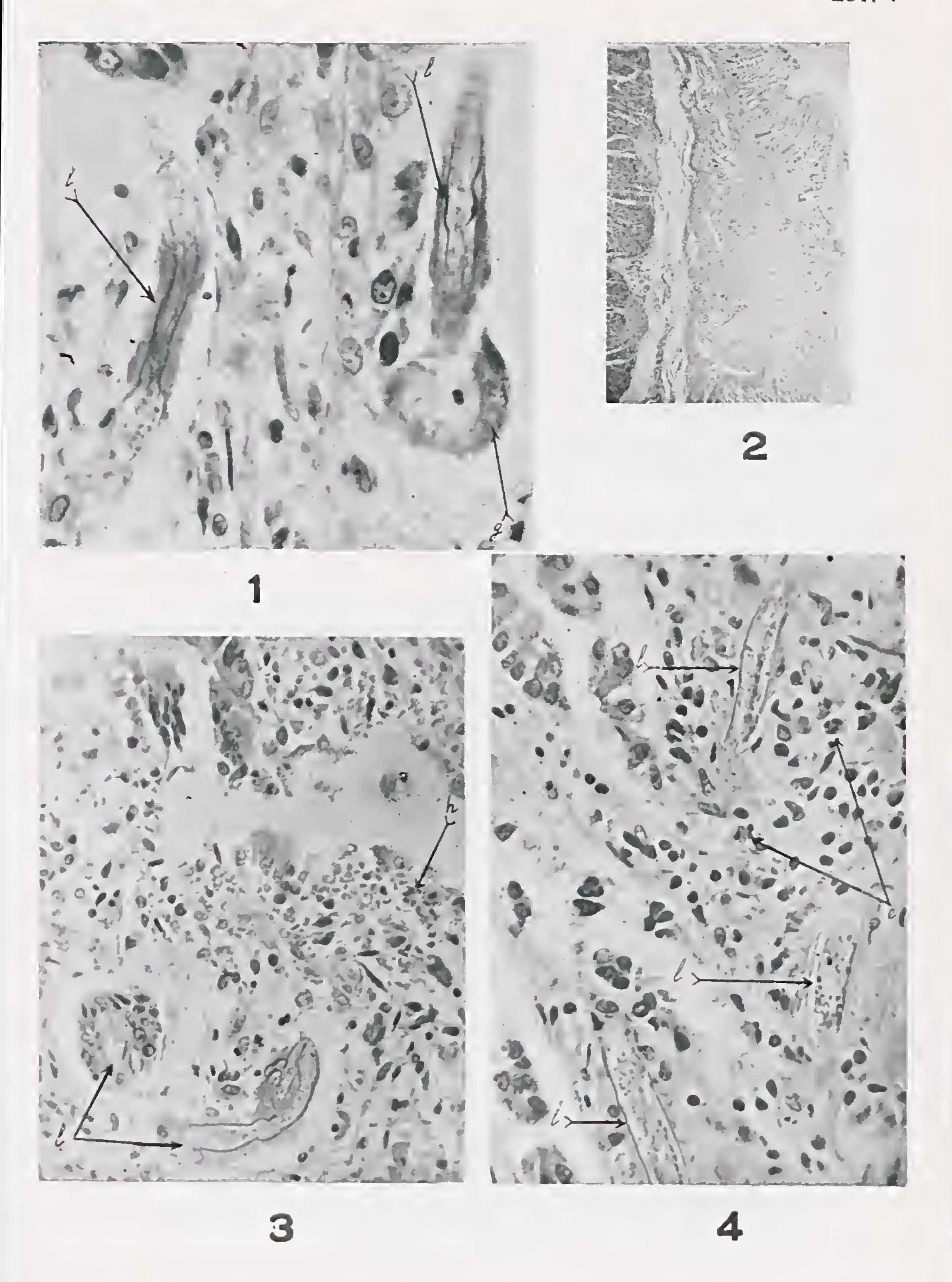
Estampa 4

Fig. 1 — Grosso intestino do Caso n.º 2983. Larvas de *Strongyloides* (*l*) alojadas na extremidade profunda das glandulas de Lieberkühn.

Fig. 2 — Grosso intestino do Caso n.º 2983. Tumefacção da mucosa e sub-mucosa. Interrupção do *muscularis mucosae*. Desintegração do epithelio de revestimento e das glandulas. Hemorrhagias, infiltração cellular e numerosas larvas de *Strongyloides* na espessura da sub-mucosa.

Fig. 3 — Grosso intestino do Caso n.º 2983. Larvas de *Strongyloides* (*l*) no interior de glandulas de Lieberkühn. Hemorrhagia (*h*).

Fig. 4 — Grosso intestino do Caso n.º 2983. Larvas de *Strongyloides* (*l*) no chorium. Em sua visinhança, leucocytos polymorphonucleares eosinophilos (*e*), lymphocytos e macrophagos.



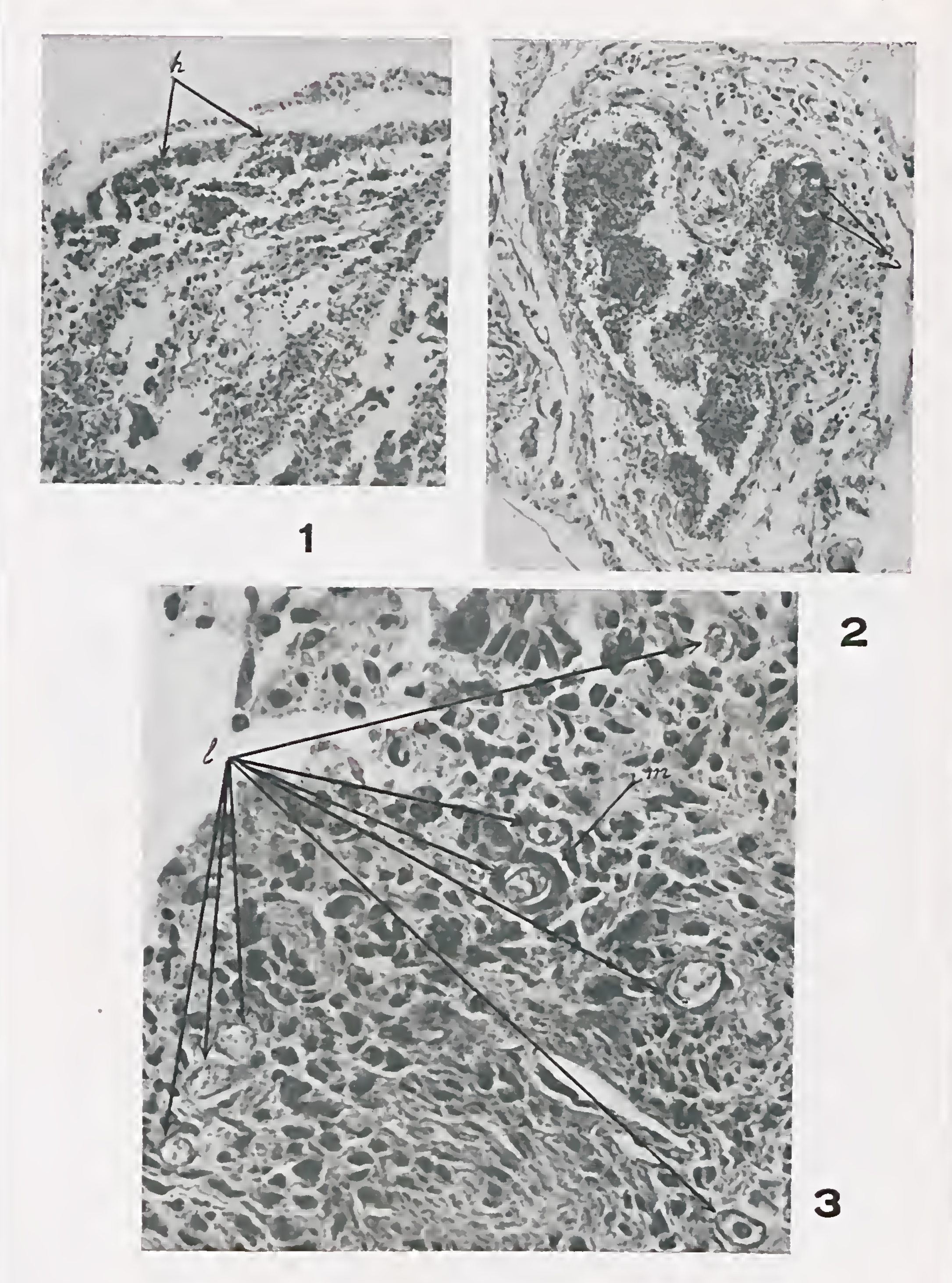
Torres & Azevedo: Lesões produzidas no homem por *Strongyloides*.

Estampa 5

Fig. 1 — Suffusão hemorrhagica (*h*) na mucosa do grosso intestino do Caso n.º 2983.

Fig. 2 — Veia colica encerrando larvas (*l*) de *Strongyloides* (Caso n.º 2983).

Fig. 3 — Fundo da ulceração representada na Est. 3, fig. 3, com grande augmento. Numerosas larvas (*l*) de *Strongyloides* em tecido de granulação constituido por macrophagos, cellulas gigantes (*m*) e lymphocytos.



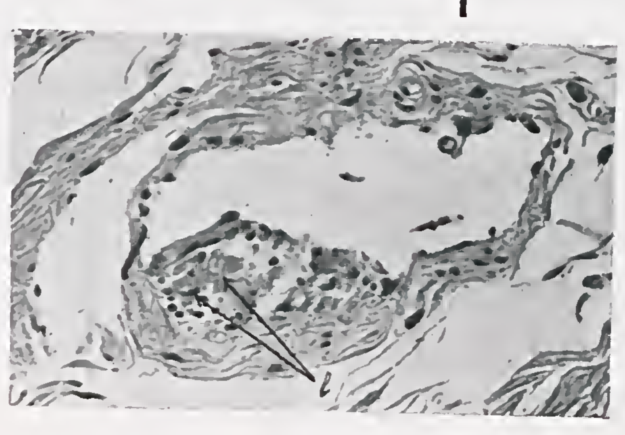
Torres & Azevedo: Lesões produzidas no homem por *Strongyloides*.

Estampa 6

Fig. 1 — Grosso intestino do Caso n.º 2983. Veia colica encerrando grande numero de larvas de *Strongyloides* (*l*). Em torno das larvas, abundante substancia homogenea (*s*), corada em roseo pela eosina. Necrose da tunica interna e thrombose obliterante. Intensa infiltração cellular nas paredes da veia e tecido circumvisinho (periphlebite).

Fig. 2 — Grosso intestino do Caso n.º 2983. Larvas de *Strongyloides* (*l*) e infiltração cellular nas paredes de vaso lymphatico da sub-mucosa. O pequeno nodulo inflammatorio contendo o helmintho faz saliencia na luz do vaso, sendo recoberto pelo endothelio intacto.

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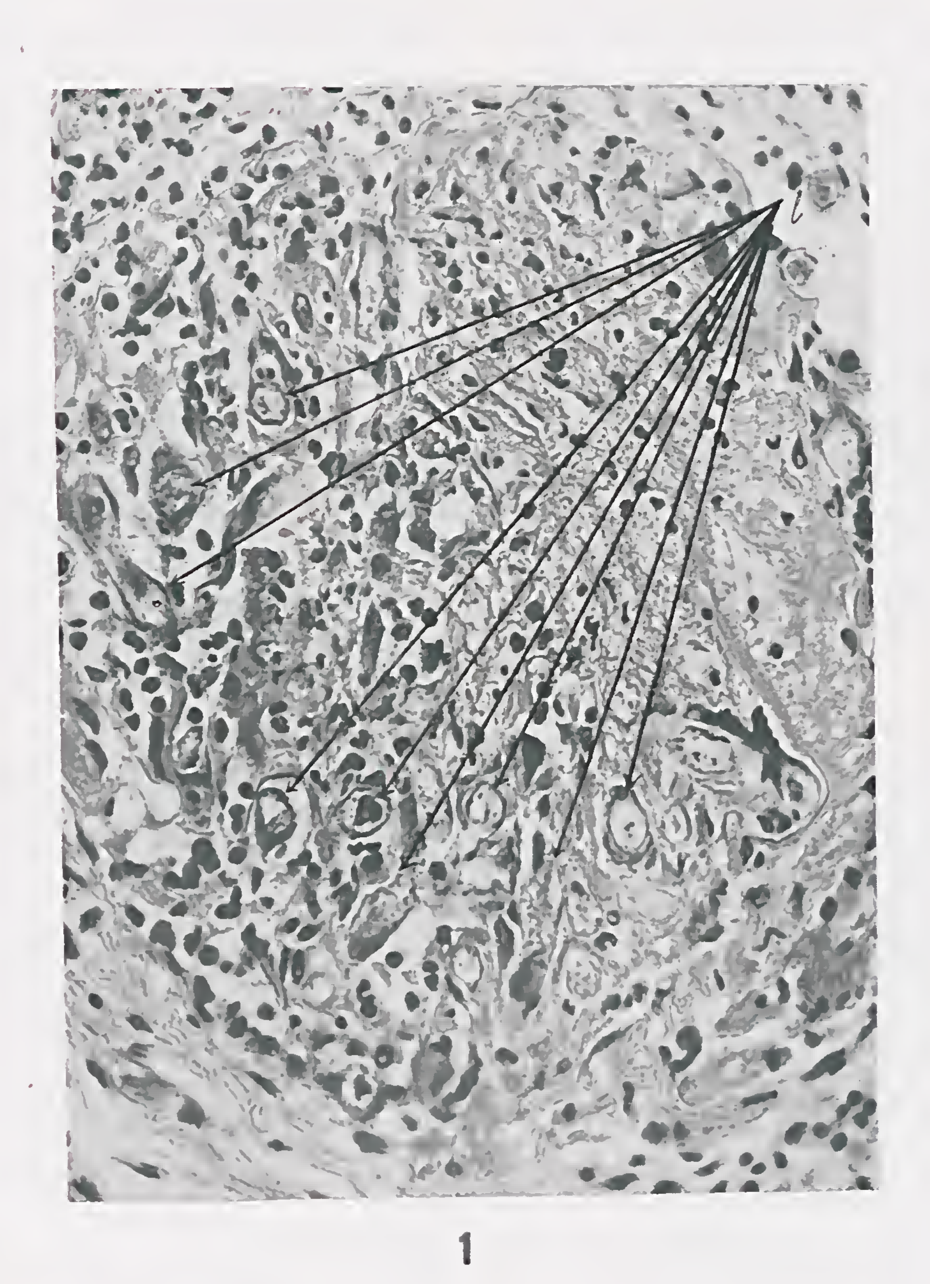
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Torres & Azevedo: Lesões produzidas no homem por *Strongyloides.*



Estampa 7

Fig. 1 — Grosso intestino do Caso n.º 2983. Thrombose obliterante em veia colica. Numerosas larvas de *Strongyloides* (*l*), fibrina, lymphocytos e macrophagos occupam a luz do vaso.



1

Torres & Azevedo: Lesões produzidas no homem por *Strongyloides*.

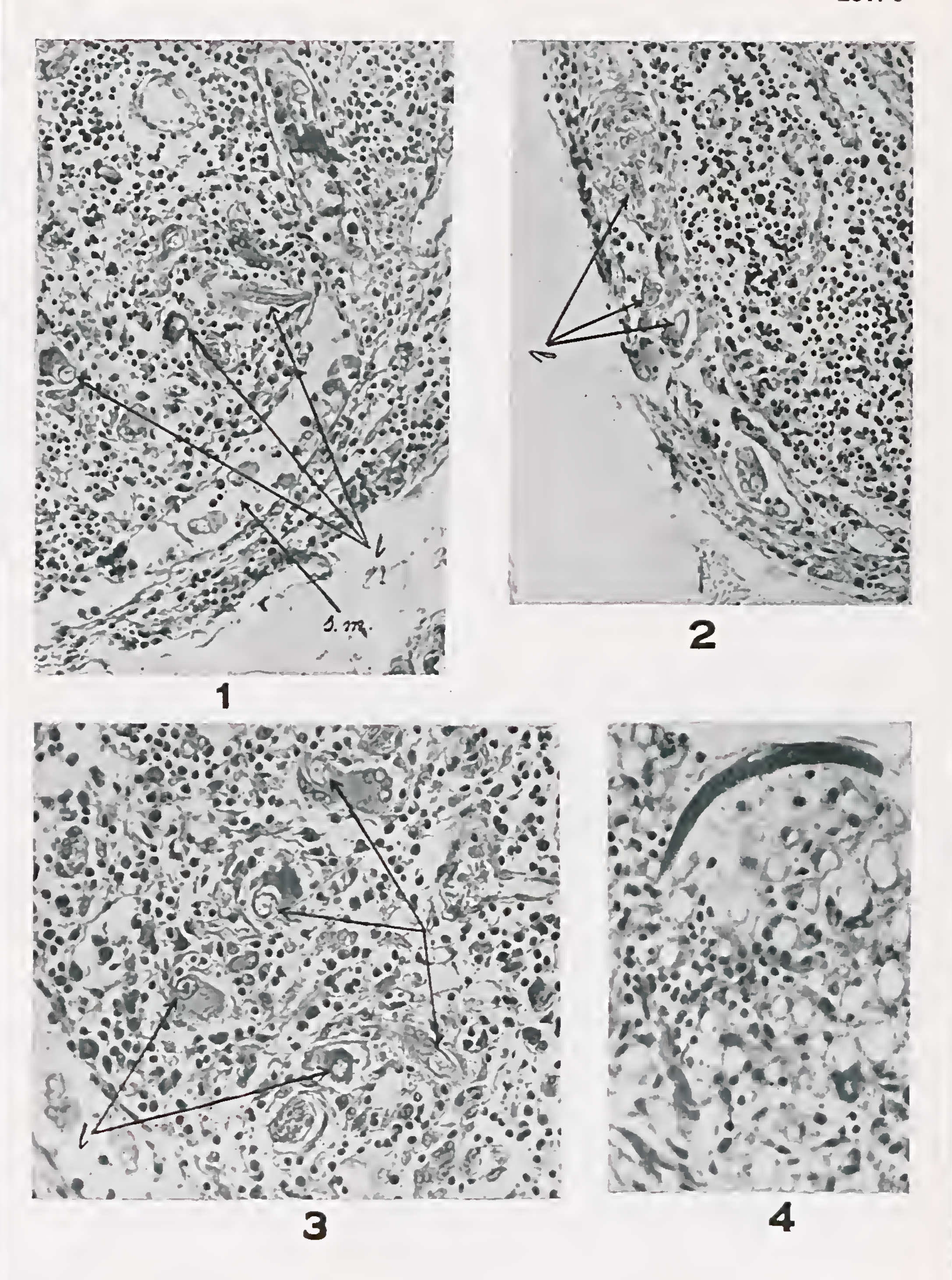
Estampa 8

Fig. 1 — Ganglio lymphatico do mesocolon (Caso n.º 2983). Numerosas larvas (*l*) de *Strongyloides* nos cordões folliculares. Seio lymphatico marginal (*s. m.*) dilatado, com cellulas endotheliaes descamadas.

Fig. 2 — Ganglio lymphatico do mesocolon (Caso n.º 2983). Larvas (*l*) de *Strongyloides* localisadas no interior do seio lymphatico marginal, dando lugar á formação de tecido de granulação.

Fig. 3 — Ganglio lymphatico do mesocolon (Caso n.º 2983). Numerosas larvas (*l*) de *Strongyloides* em cuja visinhança existem cellulas gigantes, localisadas no tecido lymphoide do ganglio, dão feição histologico peculiar ao processo de lymphadenite.

Fig. 4 — Larva de *Strongyloides* livre no tecido gorduroso do mesocolon (Caso n.º 2983).



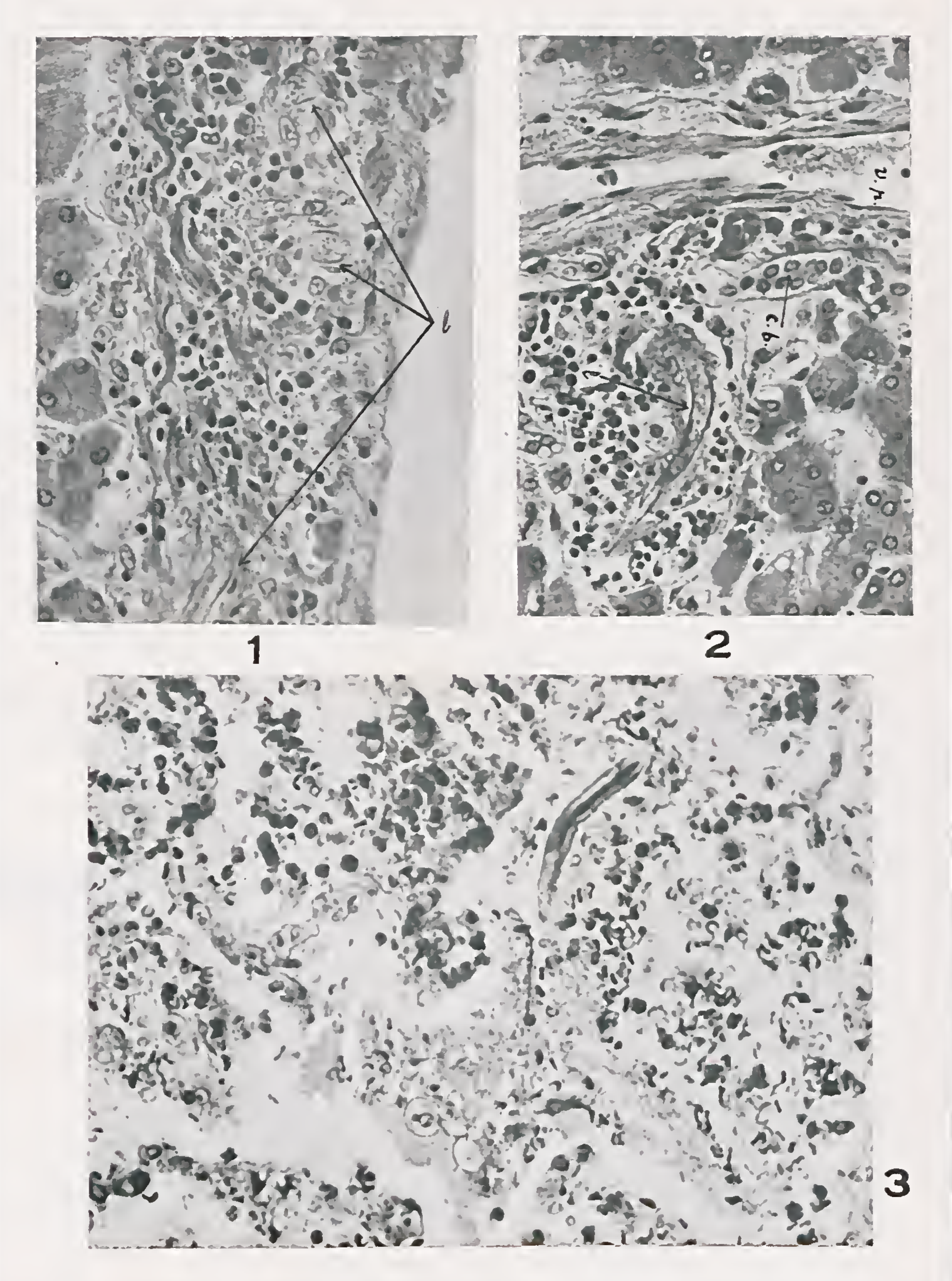
Torres & Azevedo: Lesões produzidas no homem por *Strongyloides*.

Estampa 9

Fig. 1 — Figado do Caso n.º 2983. Larvas (*l*) de *Strongyloides* nas paredes da veia-porta e infiltração cellular.

Fig. 2 — Figado do Caso n.º 2983. Larva (*l*) no espaço-porta com infiltração cellular. v. p.: veia-porta. c. b.: canal biliar.

Fig. 3 — Pulmão do Caso n. 2983. Larva na cavidade de um alveolo. Hemorrhagia e edema do pulmão.



Torres & Azevedo: Lesões produzidas no homem por *Strongyloides*.

Pseudophyllidean Cestodes occurring in the Philippines

Marcos A. Tubangui
Bureau of Science, Manila, Philippines

[With 4 plates]

According to the literature, only three species of tapeworms of the order *Pseudophyllidea* have been reported from the Philippines, the latest to be placed on record being *Diphyllobothrium latum* by Garcia & Africa (1935). In order to extend our knowledge of the group, it was decided to undertake the identification of the representatives of the order which are available in the collection of the Philippine Bureau of Science. As shown below, the collection includes five species, two of which are described as new.

Family *DIPHYLLOBOTHRIIDAE* Lühe, 1910.

Subfamily *DIPHYLLOBOTHRIINAE* Lühe, 1899.

Genus *DIPHYLLOBOTHRIUM* Cobbold, 1858.

Diphyllobothrium mansoni (Cobbold, 1883).
(Pl. 2, fig. 1).

This tapeworm is represented in the collection by several lots of specimens obtained from dogs and cats in different parts of the Philippines. It appears to be the most common, if not the only, member of the genus which infests these animals in the Islands, for which reason it is believed that it is the same kind of tapeworm which was encountered by Wharton (1917) and referred to by him as *Dyphillobothrium* sp. According to Africa (1931), two local species of copepods, namely, *Cyclops (Encyclops) serrulatus* Fisher and *C. (Microcyclops) bicolor* G. O. Sars, are suitable first intermediary hosts. The sparganum stage is frequently met with in the musculature of several species of native frogs.

The Philippine specimens conform to the description of Joyeux & Houdemer (1928) except that some of them are much wider, attaining a maximum breadth of 11 millimeters. The eggs are also larger, measuring 58.6 to 68 by 34 to 41.6 microns. They are, therefore, intermediate in size between those seen by Joyeux & Houdemer and by Yoshida (1923). According to the French authors, the terminal portion of the uterus describes three loops; according to Faust (1929), three to five. In the Philippine material the number of uterine loops is more variable, being two to six.

Genus *BOTHRIDIUM* Blainville, 1824.

Bothridium pithonis Blainville, 1824.

(Pl. 1, fig. 2 and pl. 2, fig. 3).

The occurrence in the Philippines of this common parasite of the reticulated python *(Python reticulatus)* was recorded by the writer in 1924. On circumstantial evidence it was thought possible that *Sparganum philippinensis*, which was found in a civet, might represent the plerocercoid stage of this tapeworm. It was shown by Joyeux & Baer (1927) that it had been confused with *Bothridium ovatum* (Diesing, 1850), a very closely related species found in African pythons.

Genus *DUTHIERSIA* Perrier, 1873.

Duthiersia fimbriata (Diesing, 1850).

(Pl. 1, fig. 1; pl. 2, fig. 2; and pl. 4, fig. 1).

Many writers recognize only one species of the genus *Duthiersia* as infesting the various kinds of monitors (*Varanus* spp.) found in different parts of the world. It is possible, however, as was shown by Joyeux and Baer (1927) in the case of the *Bothridium* parasites of pythons, that the monitors living in the different zoogeographical regions harbor distinct species of *Duthiersia*. This is based on the observation that the available descriptions of the worm by different authors, such as those by Lühe (1900) and by Southwell (1928), do not tally, one noteworthy difference being the number of testes found in each segment. According to Lühe, whose specimens came from Africa, the number of the testes is 300 to 400. Southwell, on the other hand, described the testes of his Indian material as «small, not numerous». The Philippine specimens, which are believed to be very closely allied, if not identical, with the Indian forms, possess only 170 to 200 testes.

This question of identity between the African and Asiatic forms of *Duthiersia* can only be conclusively decided by a detailed examination of material coming from both continents and it is hoped that it will be kept in mind by those who have better facilities than the present writer.

Genus *SCYPHOCEPHALUS* Riggenbach, 1898.

Scyphocephalus secundus n. sp.

(Pl. 1, figs. 3-7; pl. 3, figs. 3-4; and pl. 4, fig. 2).

Specific diagnosis. — With the characters of the genus. Length up to 130 mm.; maximum width 5.4 mm., in region of posterior segments. Scolex sharply set off from rest of body by a deep constriction, more or less cylindrical or globular depending upon state of contraction, measuring 1.3 to 1.9 by 1.2 to 1.5 mm. Anterior end of scolex invaginated, forming a deep terminal sucking organ, the musculature of which is moderately well-developed and quite similar to that of the suckers of some trematodes (Pl. 1, fig. 5). Bothridia

weak, their posterior edges united to form blind tubes that reach to near posterior end of head (Pl. 1, fig. 7). Neck absent. Proglottides imbricated, wider than long, the most anterior ones measuring 0.06 to 0.09 by 0.6 to 0.8 mm. and the posterior ones 0.95 to 1.85 by 4.05 to 5.4 mm. Genital openings ventral, median, at anterior half of segment, the common genital pore being at the base of a small genital sinus. Uterine pore behind common genital opening and very close to posterior border of cirrus sac (Pl. 3, fig. 4).

Cuticle 7.5 microns thick. Muscular system moderately developed. Longitudinal muscles consist of numerous fibers which are not grouped into boundles but are placed very close together and practically divide the parenchyma into cortex and medulla as in *Duthiersia fimbriata*, according to Southwell (1928). Dorso-ventral fibers many and conspicuous, circular fibers scanty. Excretory system consists principally of a larger ventral vessel and a smaller dorsal vessel on each side of median line. Each of these vessels possess numerous branches with anastomose freely with one another so that in transverse sections an even in whole mounts of the worm three to five vessels may be seen on either side of the median line.

Testes numerous, continuous from segment to segment, 230 to 300 in each segment, 42 to 80 by 38 to 80 microns in size; they are arranged in longitudinal rows in medullary parenchyma on each side of median line, but they meet anteriorly and posteriorly. Cirrus sac median, in anterior part of segment, 0.44 to 0.55 by 0.36 to 0.50 mm. in size, occupying entire thickness of medullary parenchyma. Vas deferens short, forms a conspicuous external seminal vesicle lying against postero-dorsal surface of cirrus sac. Ejaculatory duct slightly coiled, smaller in diameter than cirrus proper.

Ovary in posterior part of segment, median, flattened dorso-ventrally, with two indented wings connected by a narrow isthmus, 0.8 to 1.0 mm. from side to side and 0.36 to 0.42 mm. in greatest length. Vitelline follicles very numerous, confined in cortical parenchyma, arranged like the testes in two lateral fields but meeting along anterior and posterior margins of proglottides. Oviduct arises from middle of posterior border of ovarian isthmus. Shell gland and vitelline reservoir small, behind ovary, to one side of median line. Receptaculum seminis conspicuous, retort-shaped, 0.26 to 0.34 by 0.15 to 0.20 mm. in size, to one side of median line opposite shell gland and vitelline reservoir. Vagina opens immediately behind cirrus; vaginal sphincter absent (Pl. 4, fig. 2). Uterus at times irregularly coiled, but more often assumes the form of a rosette with four to eight loops; it is more or less uniform in diameter and in most ripe segments it is filled with eggs in its entire length. Eggs oval, operculated, usually 68 to 76 by 55 to 57 microns in size; some eggs, however, are larger, measuring 83 to 95 by 64 to 70 microns.

HOST: — *Varanus salvator* (Laurenti).

LOCATION: — Intestine.

LOCALITY: — Palo, Leyte, Philippine Islands.

TYPE SPECIMENS: — Philippine Bureau of Science parasitological collection N.° 160.

Remarks. — The members of the genus *Scyphocephalus* are apparently confined in their distribution to the Indo-Malaysian region, the type species,

S. bisulcatus, having thus far been recorded only in Sumatra by Riggenbach (1899) and in Indo-China by Joyeux & Houdemer (1928). It was thought in the beginning that the Philippine representative is identical with the type species, but a comparison between the two has revealed differences which warrant their separation as distinct species. According to Riggenbach, the scolex of *S. bisulcatus* measures 2.85 by 2.28 mm. and the eggs 66 by 57 microns; in *S. secundus* the scolex measures 1.3 to 1.9 by 1.2 to 1.5 mm. and the eggs, which are of two sizes, are 68 to 76 by 55 to 57 and 83 to 95 by 64 to 70 microns in dimensions. According to Lühe (1900), *S. bisulcatus* attains a maximum width of 3 mm. and the number of testes in each segment is 100 to 150; in *S. secundus* the proglottides attain a maximum width of 5.4 mm. and there are 230 to 300 testes in each segment. Lühe also observed that only one of the coils of the uterus of *S. bisulcatus* is enlarged and filled with eggs This condition of the uterus, which is considered by Meggitt (1924) to be of generic value, has not been generally observed in the Philippine parasite. It was only occasionally met with in some of the younger middle segments, in which the uterine coils are not yet distinctly formed.

Family *BOTHRIOCEPHALIDAE* E. Blanchard, 1849.

Genus *BOTHRIOCEPHALUS* Rudolphi, 1808.

Bothriocephalus travassosi n. sp.

(Pl. 1, figs. 8-9; pl. 3, figs. 1-2; pl. 4, figs. 3-4).

Specific diagnosis. — With the characters of the genus. Length up to 150 mm.; maximum width 2.1 mm., in region of posterior segments. Segmentation incomplete, the proglottides arranged in groups of two to seven, each group separated from its neighbours by transverse grooves that are often indistinct. Scolex rectangular in cross section, distinctly set off from rest of body, 0.75 to 1.07 by 0.45 to 0.53 mm. in size, its anterior extremity rounded and not formed into a disc as is the case with most members of the genus. Bothridia almost as long as scolex, moderately deep and wide (Pl. 1. fig. 9). All segments wider than long, the most anterior ones being narrower than the head and measuring 0.09 to 0.13 by 0.28 to 0.34 mm.; ripe proglottides 0.60 to 0.85 by 1.4 to 2.4 mm. Common genital opening at base of a shallow depression on dorsal surface, to one side of median line, about half way between uterine sac and ovary. Uterine opening ventral, median or slightly to one side of median line opposite common genital pore, in anterior third of segment.

Cuticle 3 to 4 microns in thickness. Muscular system poorly developed; longitudinal muscle fibers not grouped in bundles. Excretory system with three main longitudinal vessels on each side of median line. Chief longitudinal nerves in medullary parenchyma, one on each side, about half way between median line and lateral margin of segments.

Testes 44 to 46 in each proglottis, 45 to 58 by 42 to 50 microns in size, distributed irregularly in medullary parenchyma. Vas deferens a small coiled mass on antero-lateral border of cirrus sac, surrounded by intensely staining cells. Cirrus sac a short distance in front of ovary, to one side of

median line, its axis directed anteriorly and forming an acute angle with the dorsal surface of the body; measures 125 to 130 by 60 to 70 microns, about one-half of its length extending into medulla. Cirrus short, smaller in diameter than ejaculatory duct.

Ovary bilobed, median, at posterior part of segment, 0.45 to 0.50 mm. from side to side and 0.12 to 0.15 mm. in maximum length. Vitelline follicles numerous, smaller than testes, occupying most of the space in the cortical parenchyma except the narrow median fields of both surfaces of the body, where they are sparse or entirely absent. Transverse vitelline ducts closely applied against posterior border of ovary; vitelline reservoir small, median, dorsal to ovary. Shell gland small, behind cirrus sac. Vagina opens posteriorly to cirrus (Pl. 1, fig. 3); ductus hermaphroditicus absent. Uterine duct a coiled canal, starts from in front of either wing of ovary, crosses median line and then follows an almost straight course towards uterine sac. The latter is spherical to oval in ventral view, median or slightly to one side of median line opposite cirrus sac, 0.16 to 0.25 by 0.12 to 0.23 mm. in size, occupying at least two-thirds of dorso-ventral diameter of ripe segment. Eggs thin-shelled, operculated, oval, 42 to 47 by 30 to 31 microns in size.

HOST: — *Anguilla mauritiana* Bennett.

LOCATION: — Intestine.

LOCALITY: — Palo, Leyte, Philippine Islands.

TYPE SPECIMENS: — Philippine Bureau of Science parasitological collection N.º 156.

Remarks. — Compared with the previously recorded members of the genus *Bothriocephalus* which are parasitic in fishes, the Philippine parasite, which I have the great pleasure of naming in honor of Doctor Lauro Travassos, bears the closest resemblance to *B. formosus* Müller & Van Cleave, 1932. Both forms are characterized by the absence of a terminal disc on the scolex. *B. travassosi* may be distinguished from its near relative by its larger size, the distinct separation of the head from the neck region, the more numerous testes and the smaller operculated eggs.

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Plate 1

Fig. 1 — *Duthiersia fimbriata* (Diesing, 1850). Head, lateral view.
Fig. 2 — *Bothridium pithonis* Blainville, 1824. Head, lateral view.
Fig. 3 — *Scyphocephalus secundus* n. sp. Head, ventral view.
Fig. 4 — *Scyphocephalus secundus* n. sp. Head, lateral view.
Fig. 5 — *Scyphocephalus secundus* n. sp. Frontal section through head.
Fig. 6 — *Scyphocephalus secundus* n. sp. Cross section through middle of head.
Fig. 7 — *Scyphocephalus secundus* n. sp. Cross section through posterior end of head.
Fig. 8 — *Bothriocephalus travassosi* n. sp. Head, lateral view.
Fig. 9 — *Bothriocephalus travassosi* n. sp. Cross section through middle of head.

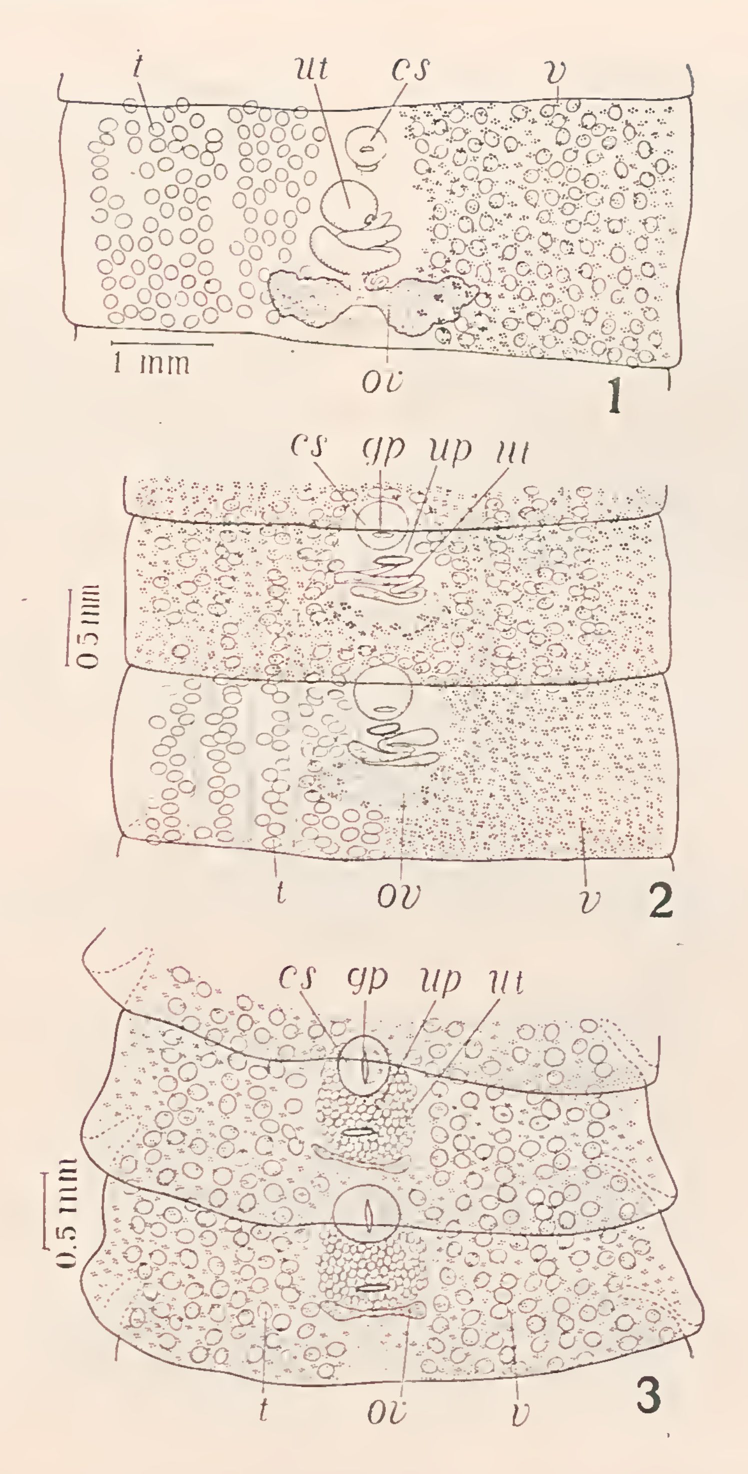
Tubangui: Pseudophyllidean Cestodes.

Plate 2

Fig. 1 — *Diphyllobothrium mansoni* (Cobbold, 1883). Ripe segment, ventral view.
Fig. 2 — *Duthiersia fimbriata* (Diesing, 1850). Two ripe segments, ventral view.
Fig. 3 — *Bothridium pithonis* Blainville, 1824. Two ripe segments, ventral view.

Abbreviations used.

cs — cirrus sac; gp — common genital pore; ov — ovary; t — testis; up — uterine pore; ut — uterus; v — vitellaria.



Tubangui: Pseudophyllidean Cestodes.

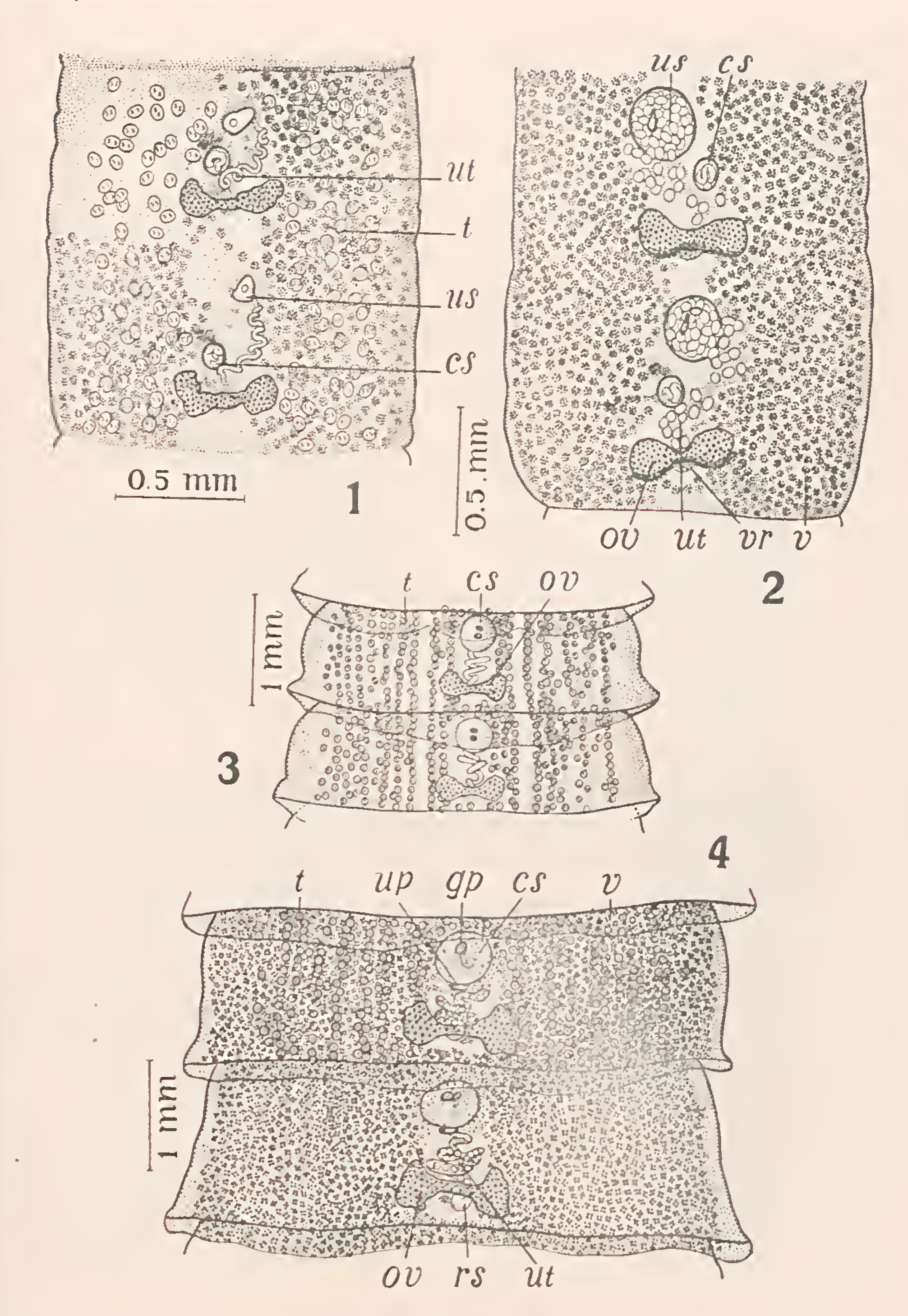
Plate 3

Fig. 1 — *Bothriocephalus travassosi* n. sp. Two young mature segments, ventral view.
Fig. 2 — *Bothriocephalus travassosi* n. sp. Two ripe segments, ventral view.
Fig. 3 — *Scyphocephalus secundus* n. sp. Two young mature segments, ventral view.
Fig. 4 — *Scyphocephalus secundus* n. sp. Two ripe segments, ventral view.

Abbreviations used.

cs — cirrus sac; gp — common genital pore; ov — ovary; rs — receptaculum seminis; t — testis; up — uterine pore; us — uterine sac; ut — uterus; v — vitellaria; vr — vitelline reservoir.

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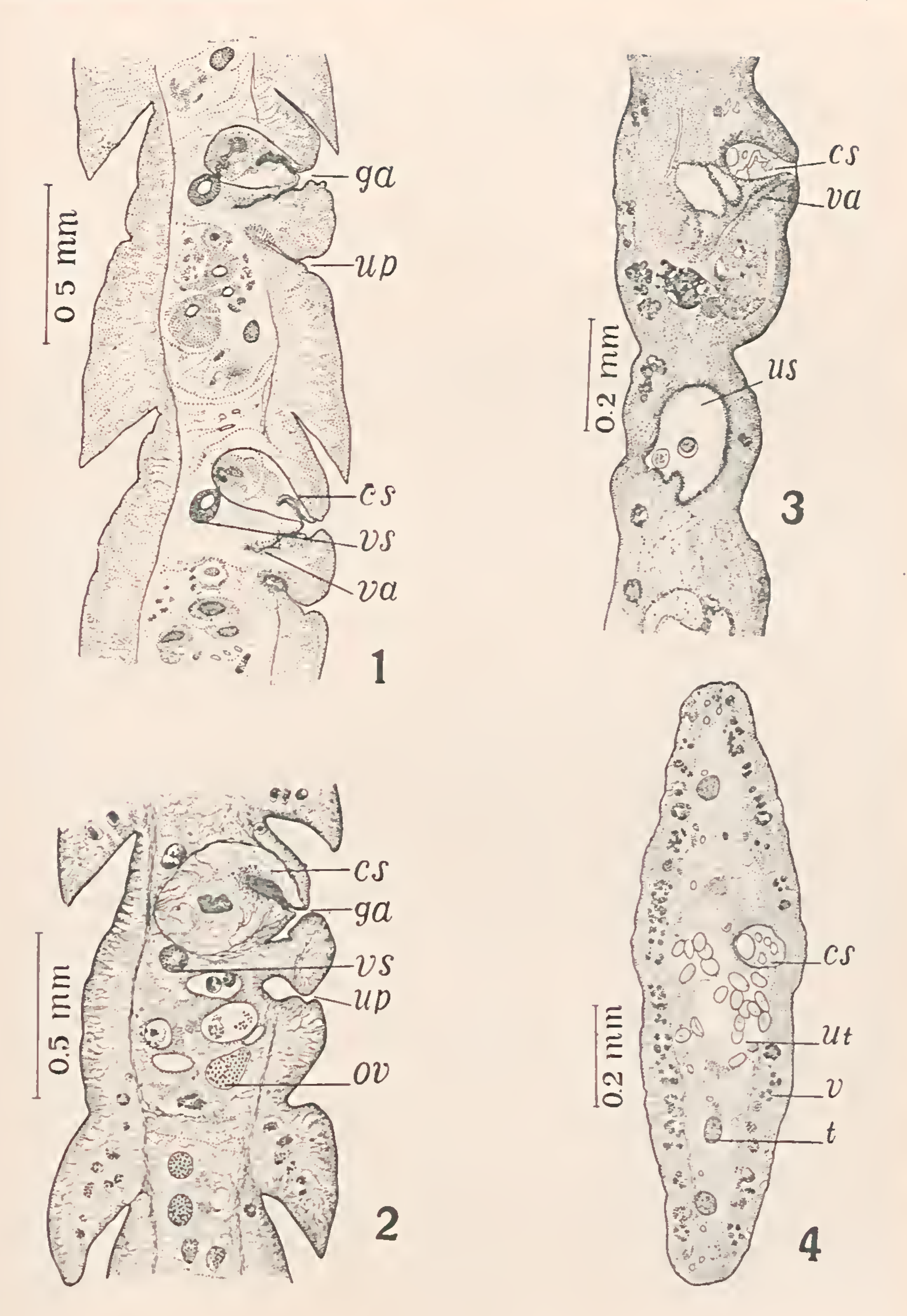
Tubangui: Pseudophyllidean Cestodes.

Plate 4

Fig. 1 — *Duthiersia fimbriata* (Diesing, 1850). Median sagittal section through two young mature segments.
Fig. 2 — *Scyphocephalus secundus* n. sp. Median sagittal section through a young mature segment.
Fig. 3 — *Bothriocephalus travassosi* n. sp. Median sagittal section through two ripe segments.
Fig. 4 — *Bothriocephalus travassosi* n. sp. Transection through cirrus sac.

Abbreviations used.

cs — cirrus sac; ga — genital sinus; ov — ovary; t — testis; up — uterine pore; us — uterine sac; ut — uterus; v — vitellaria; va — vagina; vs — external seminal vesicle.



Tubangui : Pseudophyllidean Cestodes.

Nova especie do genero Ophidascaris parasita da cascavel (Crotalus terrificus)

Z. Vaz

Professor da Universidade de S. Paulo, Assistente-technico do Instituto Biologico de S. Paulo — Brasil

[Com 1 estampa]

Em 1935 iniciamos o estudo dos ascarideos de ophideos brasileiros, aproveitando o grande e precioso material colhido na Faculdade de Medicina de S. Paulo por nosso collega Clemente Pereira ao tempo em que trabalhavamos com o Prof. Lauro Travassos, material esse incorporado hoje ás collecções do Instituto Biologico de S. Paulo.

Naquelle anno descrevemos, sob a denominação de *Ophidascaris trichuriformis*, um novo ascarideo encontrado em *Liophis miliaris* (Cobra d'agua) na qual determinava graves lesões no estomago. Dissemos naquella occasião que *O. trichuriformis* parasitava tambem a conhecidissima cascavel, *Crotalus terrificus*, mas um exame mais cuidadoso do material proveniente do estomago desta cobra, mostrou que nos enganamos e que realmente se trata de uma especie differente não só por motivos de ordem morphologica como tambem quanto ao modo de comportar-se em relação ao hospedador. Já escrevemos em nosso primeiro trabalho que *O. trichuriformis* penetra nas paredes do estomago com a extremidade anterior e esta depois de um trajecto sinuoso, ás vezes complicado, apparece novamente na luz do orgão; assim sendo, as extremidades anterior e posterior do corpo ficam livres na luz do estomago e a parte media na espessura da parede do orgão. Em *Crotalus terrificus* o *Ophidascaris* que encontramos fica com todo o corpo livre na luz do estomago, não penetrando nas paredes como succede aliás com quasi todos os ascarideos.

Morphologicamente distinguem-se com facilidade as duas especies principalmente pela cauda do macho que em *O. trichuriformis* apresenta curtas azas caudaes não presentes na nova especie, pela disposição e numero de papillas post-anaes, pelas dimensões dos espiculos e por outros caracteres menos salientes.

A primeira especie do genero *Ophidascaris* parasita de cobra sul-americana foi descripta por Baird (1860) sob o nome de *Ascaris obconica* encontrada em *Helicops (Uranops) angulatus* posteriormente redescripta por Baylis (1916) e mais tarde (1920) incluida por este mesmo autor no seu genero *Ophidascaris*, creado para os Ascarideos de cobra providos de interlabios e femeas com dois uteros e cuja especie typo é *O. filaria* (Dujardin, 1845). Baylis ao estabelecer a especie de Dujardin como typo do genero *Ophidascaris*, considerou *Ascaris rubicunda* Schneider, 1866, como synonimo de *O. filaria* o que foi aceeito por outros autores que posteriormente cuidaram do assumpto (Yorke & Maplestone, 1926); realmente, quando se lê a descripção de Schneider na pg. 42 de sua «Monographie der Nematoden», não se tem elementos para distinguir *A. rubicunda* de *A. filaria* todavia no mesmo livro á pg. 35, ao tratar

da morphologia dos *Ascaris* Schneider diz que todas as especies tem dois ovarios, excepto *A. rubicunda* e *A. quadrangularis* que possuem quatro ovarios; logo, *A. rubicunda* não póde ser synonimia de *O. filaria* e deve ser incluida no genero *Polydelphis* bem como *A. quadrangularis* parasita de *Crotalus* sp. do Brasil. Voltaremos posteriormente a este assumpto cuidando das especies sul-americanas do genero *Polydelphis* e do genero *Hexametra* Travassos, 1919, que deve subsistir.

O obconica é uma especie bem caracteristica e que se distingue das demais especies americanas do genero *Ophidascaris*, á excepção de *O. labiatopapillosa* Walton, 1927, pela situação da vulva da femea que está no 1/3 posterior do corpo; desta ultima especie se distingue pelas dimensões dos ovos que são de 100 × 100 micra em *O. obconica* e 30 × 28 micra em *O. labialopapillosa*.

Sprehn (1929) descreveu sob o nome de *O. arndti* uma nova especie baseado em material vomitado por uma cobra sul-americana em captiveiro no Aquario de Berlim e que foi determinada como *Lachesis lanceolatus*. Deve-se notar que segundo Afranio do Amaral (1937) sob o antigo nome de *Lachesis lanceolatus* conhecem-se hoje pelo menos 3 especies do genero *Bothrops* que são *B. jararaca*, *B. jararacussú* e *B. atrox* de forma que não sabemos na realidade qual das tres especies é a parasitada por *O. arndti*. Quero notar ainda que faltam á descripção de Sprehn, desenhos das partes do corpo que mais interessam á diagnose especifica, limitando-se a desenhar um labio sem escala, e a vagina com os dois uteros que infelizmente pouco auxiliam o reconhecimento da especie.

Tanto *O. trichuriformis* quanto a especie que vamos descrever differem de *O. arndti* principalmente pela cauda do macho que em *O. arndti* é pelo menos 3 vezes maior que nas duas outras especies, dimensões dos labios, numero de papillas post-anaes.

Resumiremos adiante, num quadro, os caracteres fundamentaes das especies americanas do genero *Ophidascaris* Baylis, 1920.

Ophidascaris travassosi n. sp.

Ascarideos bastante grandes de colorido esbranquiçado, livres na cavidade do estomago, pouco mais largos na metade posterior do corpo que na anterior, porque naquella porção localisam-se os tubos genitaes; nunca mostram porém o aspecto exaggerado deste phenomeno que se observa em *O. trichuriformis*.

Comprimento: — Macho 50-60 mm.; femea 70-80 mm.

Largura: — Macho 0,7 mm.; femea 1,0 mm. abaixo da vulva e 0,6 mm. acima della.

Bocca guarnecida de 3 labios, um dorsal e dois sub-ventraes, separados por interlabios bem desenvolvidos. Os labios são providos de uma serrilha de pequenos dentes acompanhando a margem livre dos labios em quasi toda a extensão. O labio dorsal é provido de duas papillas bem desenvolvidas situadas lateralmente, e os labios sub-ventraes possuem uma papilla grande, desviada da linha mediana e proxima de um dos bordos lateraes e ainda 2 pequenas papillas mal visiveis, tambem desviadas da linha mediana e proximas do bordo anterior. Os interlabios, ainda que nitidos, não mostram o espessamento cuticular bem visivel em *O. trichuriformis*.

Macho: — Esophago medindo mais ou menos 3 mm. de comprimento por 0,4 mm. de largura maxima na extremidade posterior. A abertura cloacal situa-se a 0,24 mm. da ponta da cauda. A extremidade posterior do macho é encurvada sobre a face ventral, sendo a cauda curta e afilada bruscamente, terminando em ponta fina. A cuticula espande-se ligeiramente ao nivel da cauda, sem formar todavia verdadeiras azas caudaes. Existem 7 pares de papillas post-anaes das quaes um par de grandes papillas sub-lateraes perto do anus, 3 pares sub-ventraes a meia distancia entre a cloaca e a ponta da cauda e 3 pares lateraes; destes, o primeiro é isolado e os dois outros são juntos proximo da ponta da cauda.

Além das papillas post-anaes, verificamos a presença de grande numero de papillas pré-anaes dispostas em duas filas, sub-ventraes, uma de cada lado, cada fila com mais ou menos 30 papillas muito proximas umas das outras na visinhança da cloaca, augmentando o espaço entre ellas a medida que se afastam desta abertura.

Os espiculos são iguaes, bem chitinizados, apresentando a extremidade distal afilada e medindo 2 mm. de comprimento.

Femea: — Esophago aproximadamente cylindrico, musculoso, alargando-se ligeira e gradualmente para a extremidade posterior, medindo 3,6 mm. num exemplar de 70 mm. Cauda relativamente curta, com extremidade arredondada, estreitando-se bruscamente. O anus está localisado a 0,22-0,24 mm. da extremidade posterior.

Vulva situada mais ou menos no meio do corpo, abrindo-se a 33 mm. da extremidade posterior. Vagina curta, musculosa, dirigida para traz, seguida por dois uteros, que continuam a direcção posterior. Todo o apparelho genital feminino está localisado na metade posterior do corpo, atraz da vulva, como occorre aliás com as demais especies do genero. Ovos não embryonados approximadamente esphericos, medindo 64-68 micra de diametro maior por 58-62 micra de diametro menor.

HABITAT: — Estomago de *Crotalus terrificus*, nome vulgar — cascavel.
DISTRIBUIÇÃO GEOGRAPHICA: — Estado de S. Paulo, Brasil.
TYPO e PARATYPOS: — Collecção helminthologica do Instituto Biologico de S. Paulo, n.º 717.

DIMENSÕES EM MILLIMETROS DAS ESPECIES AMERICANAS DO GENERO *OPHIDASCARIS* BAYLIS, 1920.

	O. obconica (Baird, 1860).		*O. labialopapillosa* Walton 1927.		*O. arndti* Sprehn 1929.		*O. trichuriformis* Vaz, 1935.		*O. travassosi* n. sp.	
	macho	femea	macho	femea	macho	femea	macho	femea	macho	femea
Comprimento	45-50	52	—	62	24-37	27-48	120	—	55	70
Largura maxima	2	—	—	0,7	0,5-0,6	0,6-0,8	1,5	—	0,7	—
Esophago { Comprimento	2-3	—	—	2,75	3,0	—	3,8	—	3,0	3,6
Esophago { Largura	—	—	—	—	—	—	—	—	0,4	—
Póro excretor	—	—	—	—	—	—	—	—	—	—
Vulva da extremidade posterior	—	15	—	20	—	28	—	—	—	33
Anus da extremidade posterior	0,2	0,2	—	0,32	0,8-1,0	0,3-0,5	0,26	—	0,24	0,24
Espiculos	2,48	—	—	—	1,7	—	3,7	—	2	—
Ovos { Comprimento	—	0,100	—	0,030	—	—	—	—	—	0,066
Ovos { Largura	—	0,100	—	0,028	—	—	—	—	—	0,060
Papillas pré-anaes	40	—	—	—	20	—	40	—	30	—
Papillas post-anaes	4	—	—	—	—	—	6	—	7	—
Labios { Comprimento	0,17	—	—	0,22	0,35	—	0,15	—	—	0,15
Labios { Largura	0,17	—	—	0,13	0,35	—	—	—	—	—
Hospedadores	*Helicops angulata* (L.)		*Coluber constrictor; Natrix sp.*		*Lachesis lanceolatus ?* Vide texto.		*Liophis miliaris* (L.)		*Crotalus terrificus* (Laurentius, 1768).	

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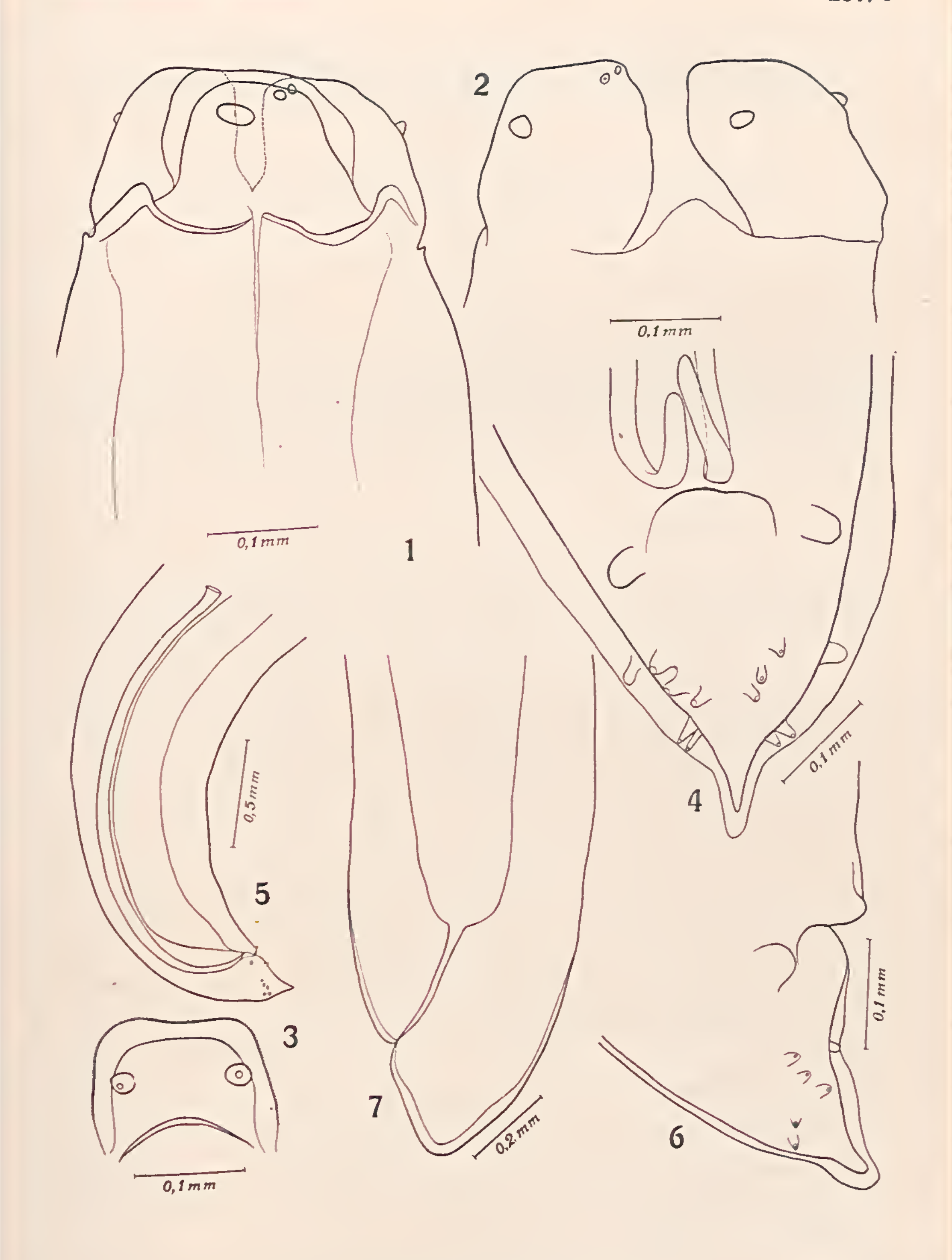
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Estampa 1

Ophidascaris travassosi n. sp.

Fig. 1 — Extremidade anterior, labio sub-ventral.
Fig. 2 — Interlabio.
Fig. 3 — Labio dorsal.
Fig. 4 — Cauda do macho vista de frente.
Fig. 5 — Porção posterior do macho, espiculos.
Fig. 6 — Cauda do macho vista de perfil.
Fig. 7 — Cauda da femea vista de perfil.



Vaz: Nova especie do genero *Ophidascaris*.

Nota sobre algunos nematodes parasitos nuevos de Cuba

I. Pérez Vigueras.
Prof. Esc. Med. Vet. Univ. Habana, Miembro Acad. Ciencias de la Habana

[Con 6 planchas]

DEDICATORIA

El autor experimenta especial complacencia en dedicar éste trabajo al Señor Profesor Doctor Lauro Travassos, cuyas notables investigaciones han hecho avanzar, de manera considerable, los conocimientos de la Helmintología, y al mismo tiempo, desea expresarle su respeto y consideración personal.

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Material y posición sistemática de las especies.

Las cuatro especies nuevas de Nematodes parásitos más abajo descritas, forman parte de una extensa colección del autor, y fueron seleccionadas especialmente para éste trabajo.

La posición sistemática de ellas puede ser la siguiente:

Oxyurata Skrjabin 1923.

Oxyuroidea Railliet 1915.

Oxyuridae Cobbold 1864.

Laurotravassoxyurinae n. sub-fam.

Laurotravassoxyuris n. gen.

L. travassosi n. sp.

Hospedero: — *Holacanthus tricolor* (Bloch) (Pisces)

Oxyurinae Hall 1916.

Travassozolaimus n. gen.

T. travassosi n. sp.

Hospedero: — *Chamaeleolis chamaeleontides* (Dum. & Bibr.) (Reptilia)

Strongylata Railliet & Henry 1913.

Trichostrongyloidea Cram 1927.

Trichostrongylidae Leiper 1912.

Trichostrongylinae Leiper 1908.

Oswaldocruzia Travassos 1917.

O. lenteixcirai n. sp.

Hospedero: — *Hyla septentrionalis* (Boulenger) (Amphibia)

Spirurata Railliet & Henry 1915.

Spiruroidea Railliet & Henry 1915.

Acuariidae Seurat 1913.

Acuariinae Railliet, Henry & Sisoff 1912.

Cheilospirura Diesing 1861.

C. multispinosa n. sp.

Hospedero: — *Botaurus lentiginosus lentiginosus* (Montagu) (Aves).

***

DESCRIPCIÓN DE LAS ESPECIES

1 — Laurotravassoxyuris travassosi n. sp.

HOSPEDERO: — *Holacanthus tricolor* (Bloch).
LOCALIZACIÓN: — Ampolla rectal.
LOCALIDAD: — Playas de « Santa Fé » y de « La Chorrera » (Litoral Norte de la Habana, Cuba).

Descripción. — (Pl. 1, figs. 1-5; pl. 2, figs. 1-2; pl. 6, fig. 1). — *Laurotravassoxyuris.* — Cuerpo pequeño, de color blanco, atenuado en los extremos en ambos sexos, extremo caudal terminado en una cola larga y fina, cutícula con estriaciones transversales muy finas y con seis bandas longitudinales, boca circular, pequeña, provista de sies láminas rectangulares que nacen en el origen del oesophagus, cuyo bordo libre o anterior forma seis ángulos dirigidos hacia afuera, láminas que limitan un vestíbulo oral exagonal relativamente largo.

Macho: — Longitud total 1 a 1.5 mm., latitud máxima 250 micras, vestíbulo oral de 32 micras de largo por 16-18 micras de diámetro, anillo nervioso a 3.75 micras y poro excretor a 1.12 mm. del extremo cefálico, con posición post-bulbar, extremo anterior atenuado y redondeado, con cuatro papilas circumorales, relativamente grandes, umbilicadas, oesophagus de 675 micras de longitud por 80 micras de ancho, bulbo esofágico de 160 micras de diámetro, abertura cloacal a 418 micras de la punta caudal, la cola es delgada, de diámetro bastante uniforme y de punta roma, y mide aproximadamente 240 micras de largo. A 285 micras del extremo caudal presenta una papila pequeña, globulosa, impar y mediana en posición. La abertura cloacal es prominente, en el borde pre-cloacal presenta dos procesos mamiliformes terminados en una pequeña papila cada uno, además se encuentra a cada lado o sea en posición ad-cloacal un proceso digitiforme. La espícula única mide 230 micras de largo, es granulosa en su interior y termina en punta aguda, su extremo proximal se dobla en un ángulo para dirigirse hacia arriba y atrás y terminar bifurcándose. El gubernaculum es de 112 micras de largo, infundibuliforme, formando una especie de estuche o vaina a la espícula. No existen alas caudales o membranas.

Hembra: — Longitud total 7.5 a 8 mm., latitud máxima 730 micras, oesophagus de 930 micras de largo por 96 micras de diámetro, bulbo esofágico de 109 micras de diámetro, anus a 620 micras y vulva a 2.58 mm. de la punta de la cola, con abertura transversal y un repliege anterior, pequeño, derivado de la cutícula, vagina de superficie interior muy granulosa, ovijector pequeño con una válvula interior, dos tubos uterinos replegados varias veces pasando invariablemente por delante del bulbo esofágico y dos ovarios terminados atenuandose.

Huevos elípticos, de cáscara gruesa, grandes, asimétricos, que miden 120-130 micras de largo por 46-50 micras de ancho, segmentados, provistos en cada extremo de un pequeño casquete adicional, en los cuales se fijan respectivamente 4 y 6 largos cordones o látigos de 3 micras de grueso que se reunen dentro del útero formando lárgas cabelleras o haces.

LAUROTRAVASSOXYURIS n. gen.

Caracteres del género. - *Laurotravassoxyurinae.* — Cuerpo pequeño, blanco, cutícula finamente estriada en el sentido transversal, en la hembra con 6 bandas longitudinales, granulosas, con numerosos pequeños discos en cuyo centro existe un pequeñísimo proceso papiliforme. Extremo cefálico redondeado con cuatro papilas circumorales salientes y gruesas, boca sin labios, circular con 6 láminas rectangulares que nacen a nivel del origen del oesophagus. Cada lámina forma en su bordo libre un ángulo dirigido hacia afuera, ellas limitan un vestíbulo oral exagonal, oesophagus de diámetro uniforme terminado en un bulbo con tres valvas. Extremo posterior del macho progresivamente atenuado, con una papila impar, globulosa, en posición mediana y situada en el primer tercio de la distancia de la cloaca a la punta de la cola, cloaca prominente con dos procesos mamiliformes pre-cloacales y dos, uno a cada lado, ad-cloacales, digitiformes, una espícula con extremo proximal doblado en ángulo y bifurcado, gubernaculum infundibuliforme, vulva posterior a la mitad del cuerpo. Parásitos de peces.

TIPO-ESPECIE: — *Laurotravassoxyuris travassosi.*

LAUROTRAVASSOXYURINAE n. sub-fam.

Laurotravassoxyuris presenta los caracteres generales asignados a la familia *Oxyuridae* y pudiera ser colocado en la sub-familia *Syphaciinae* Railliet 1916 debido a que presenta una sola espícula y un gubernáculum, pero los géneros incluídos en ella ofrecen 3-6 labios definidos, mientras que en el nuevo género propuesto no existen labios y la estrutura de la boca difiere esencialmente por presentar una corona de 6 láminas que limitan un vestíbulo oral. La estrutura de la boca ha sido utilizada por Ortlepp para crear la sub-familia *Ozolaiminae* Ortlepp 1933, que Pereira ha elevado a la categoría de familia *Ozolaimidae* Pereira 1935, basándose éstos autores especialmente en la presencia de dos labios en las especies de *Ozolaimus* y *Macracis*. *Ozolaimus* responde a los caracteres de *Oxyuridae* pero la sub-familia está justificada.

La sub-familia aquí propuesta puede ser definida como sigue: *Oxyuridae* con una sola espícula y con gubernáculum, boca sin labios, con una corona de 6 láminas que limitan un vestibulo oral.

TIPO GÉNERO: — *Laurotravassoxyuris*.

2 — Travassozolaimus travassosi n. sp.

HOSPEDERO: — *Chamaeleolis chamaeleontides* (Dum. & Bibr.).
LOCALIZACIÓN: — Ampolla rectal.
LOCALIDAD: — Cojímar (Prov. de la Habana).

Descripción: — (Pl. 3, figs. 1-4; pl. 4, figs. 1-3; pl. 6, fig. 2). — Cuerpo pequeño, blanco, atenuado en ambos extremos en los dos sexos, extremo cefálico redondeado, sin papilas aparentes, boca pequeña y circular con tres labios rudimentarios, vestíbulo oral pequeño, eosophagus largo y de diámetro sensiblemente uniforme, bulbo esofágico con tres valvas.

Macho. — Longitud total 4 a 4.5 mm.; latitud máxima 320 micras, oesophagus de 1.02 a 1.1 mm. de largo por 48 micras de ancho, bulbo esofágico de 190 micras de diámetro seguido de una amplia dilatación intestinal, anillo nervioso a 210 micras y poro excretor a 1.3 mm. del extremo cefálico siendo por lo tanto de posición post-bulbar, abertura cloacal a 225 micras de la punta de la cola. La extremidad posterior es truncada abruptamente en su parte ventral pero en la dorsal se continúa por una cola larga terminada en punta fina cuya longitud es de 170 micras y terminada en un apéndice filiforme. La abertura cloacal es prominente, y presenta dos procesos mamiliformes terminados cada uno en una pequeña papila, situados inmediatamente en posición pre-cloacal, y tres procesos quitinosos digitiformes en posición inmediatamente post-cloacal, éstos se continúan hacia atrás por dos ramas laterales que sostienen un par de láminas quitinizadas de forma cóncavo-convexa, de ángulos redondeados, que se encuentran situadas a una distancia de 190 micras de la punta de la cola, dos alas caudales laterales relativamente espesas y anchas se extienden desde las proximidades de la abertura cloacal hasta un poco más allá de las láminas caudales.

Hembra. — Longitud total 6-6.8 mm., latitud máxima 530 micras, oesophagus de 1.25 mm. de longitud por 64 micras de diámetro, bulbo esofágico

de 280 micras de diámetro, anillo nervioso a 270 micras y poro excretor a 1.45 mm. del extremo cefálico, anus a 1.28 mm. y vulva a 3.15 mm. del extremo caudal, ovijector a 210 micras de la vulva, cola de 880 micras de largo atenuada progressivamente hasta terminar en punta fina.

Huevos elípticos, asimétricos, segmentados, operculados, en pequeño número, de 130-140 micras de largo por 80-90 micras de ancho.

TRAVASSOZOLAIMUS n. gen.

Caracteres del género. — *Oxyurinae.* — Extremo cefálico redondeado, sin papilas aparentes, orificio oral circular, con tres labios rudimentarios, vestíbulo oral circular, oesophagus largo, de diámetro uniforme, terminado en un bulbo; extremo caudal del macho atenuado abruptamente en su parte ventral y por su parte dorsal terminado en una cola larga y delgada, abertura cloacal prominente, con dos procesos mamiliformes terminado cada uno en una pequeña papila y en posición inmediatamente pre-cloacal, tres procesos quitinosos digitiformes en posición inmediatamente post-cloacal, dos láminas quitinosas cóncavo-convexas sostenidas por dos ramas quitinosas y dos alas caudales membranosas laterales; una sola espícula terminada en punta fina. Sin gubernaculum o pieza accesoria. Vulva muy cerca a la mitad del cuerpo. Parásitos de reptiles.

TIPO-ESPECIE: — *Travassozolaimus travassosi.*

3 — Oswaldocruzia lenteixeirai n. sp.

HOSPEDERO: — *Hyla septentrionalis* (Boulenger).
LOCALIZACIÓN: — Intestino.
LOCALIDAD: — Santiago de las Vegas y Cojímar. (Prov. de la Habana, Cuba).

Descripción. — (Pl. 3, figs. 5-6; pl. 4, figs. 4-5; pl. 6, fig. 3). — *Oswaldocruzia.* — Cuerpo filiforme, cutícula cefálica inflada, con estriaciones transversales, cutícula del cuerpo con estriaciones longitudinales bien aparentes, sin estriaciones transversales, sin alas laterales ni papilas cervicales.

Macho: — Longitud total 7.5-8 mm., latitud máxima 0.16 mm., anillo nervioso a 170 micras y poro excretor a 260 micras del extremo cefálico, oesophagus de 435 micras de largo por 80 micras de diámetro máximum y 40 micras de ancho mínimum, cutícula cefálica inflada de 56 micras de largo, estrecha; espículas iguales en forma y tamaño, de 160-170 micras de largo por 40 micras de ancho máximum y con una delicada membrana espicular en su extremo distal, son trifurcadas en su tercio proximal y cada rama termina por numerosas y pequeñas varillas de punta fina, algunas de las cuales se prolongan hacia el interior de la membrana espicular haciéndose muy tenues, hasta desaparecer. Ambas espículas se deslizan por una pieza quitinizada, infundibuliforme, cuya punta es tridentada. La bolsa copulatriz y los sistemas de costillas son semejantes a los de otras especies del género. La bolsa es trilobada, mide 120 micras de largo por 112 micras de ancho. La costilla dorsal, que es la más importante en éste género, termina bifurcándose en dos ramas cortas,

de base gruesa, cada una de las cuales presenta una tuberosidad externa, antes de la bifurcación, en su trayecto ésta costilla dá dos vástagos laterales en forma de ganchos dirigidos hacia afuera.

Hembra. — Longitud total 12.5-14 mm., latitud máxima 0.21 mm., oesophagus de 480-510 micras de largo por 80 micras de diámetro máximum y 48 micras de ancho mínimum, poro excretor a 210 micras del extremo cefálico, anus a 200 micras y vulva a 5.5 mm. del extremo caudal, cola atenuada progresivamente, de extremos redondeados con la cutícula inflada ligeramente y con un proceso espiniforme delgado que mide 16-18 micras de largo; ovijector de 850 a 870 micras de largo. La vulva ofrece una amplia abertura y está provista de dos labios internos quitinizados, muy visibles porque sobresalen, en las hembras jóvenes.

Huevos ovales, segmentados, de 80-85 micras de largo por 48-52 micras de ancho.

Discusión de la especie. — *Oswaldocruzia lenteixeirai* ofrece algunas semejanzas con *Oswaldocruzia subauricularis* Rud.) y como ésta entraría también en el sub-género *Oswaldocruzia* Morishita 1926, pero difiere de ella por la forma terminal de la costilla dorsal, la longitud de las espículas y la longitud del ovijector, que es aproximadamente de doble longitud. Lent y Teixeira de Freitas forman con las especies conocidas del género *Oswaldocruzia* dos grupos: primer grupo con espículas mayores de 0.2 mm., segundo grupo con espículas menores de 0.2 mm. En éste último colocan: *O. leidyi* Trav., *O. molgela* Lewis, *O. brasiliensis* Lent y Teixeira de Freitas y debe colocarse también *O. lenteixeirai.*

4 — Cheilospirura multispinosa n. sp.

HOSPEDERO: — *Botaurus lentiginosus lentiginosus* (Montagu).
LOCALIZACIÓN: — Proventrículo.
LOCALIDAD: — Artemisa (Prov. de Pinar del Río, Cuba).

Descripción. — (Pl. 5, figs. 1-5; pl. 6, fig. 1). — *Cheilospirura.* — Cuerpo blanco, uniformemente cilíndrico, atenuado en los dos extremos en ambos sexos, cutícula con fina estriación transversal bien aparente, dos labios cónicos prominentes, dos pares de papilas cefálicas bien aparentes, de dónde parten cuatro gruesos cordones, dobles, flexuosos, que terminan a corta distancia del extremo posterior del segundo oesophagus, sin recurrencia ni anastomosis, cada cordón presenta en toda su longitud hileras transversales de 6-8 procesos espiniformes, muy pequeños, dirigidos hacia atrás. No se observaron papilas cervicales. Pharynx quitinosa, de paredes gruesas, infundibuliforme en su extremo anterior, oesophagus anterior o musculoso, corto, oesophagus posterior o glandular, largo.

Macho: — Longitud total 8-10.5 mm., latitud máxima 0.12 mm., cordones de 1.92 mm. de largo, pharynx de 190-220 micras de largo por 20 micras de diámetro medio, oesophagus anterior de 560 micras de largo por 112 micras de diámetro máximum, oesophagus posterior de 1.70 mm. de largo por 260 micras de ancho, extremo caudal ligeramente arqueado, alas laterales caudales muy estrechas, punta de la cola digitiforme, abertura cloacal a 160-180 micras de la punta de la cola, prominente, nueve pares de papilas caudales más una

papila impar. De éstas papilas cuatro pares son pre-cloacales y cinco pares post-cloacales, la papila impar es grande, está colocada en posición mediana, a 32 micras de la punta de la cola y entre el último par de papilas post-cloacales. Espículas desiguales en tamaño, la mayor mide 710 micras de largo por 22 micras de diámetro, presenta la forma de una varilla fina, curva, terminada en punta aguda, la menor mide 275 micras de largo por 32 micras de grueso máximum, ofrece en su extremo distal una pequeña dilatación discoide y transparente.

Hembra. — El único ejemplar hembra recolectado se encuentra en muy mal estado de conservación. Mide 19 mm. de largo por 0.83 mm. de diámetro, la vulva se encuentra a 560 micras y el anus a 170 micras de la punta de la cola.

Huevos elípticos, de cáscara gruesa, segmentados y en parte embrionados, de 48-52 micras de largo por 30-32 micras de ancho. Esta especie presenta caracteres suficientemente típicos propios, por tanto no requiere que se abra una discusión acerca de su validez.

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Plancha 1

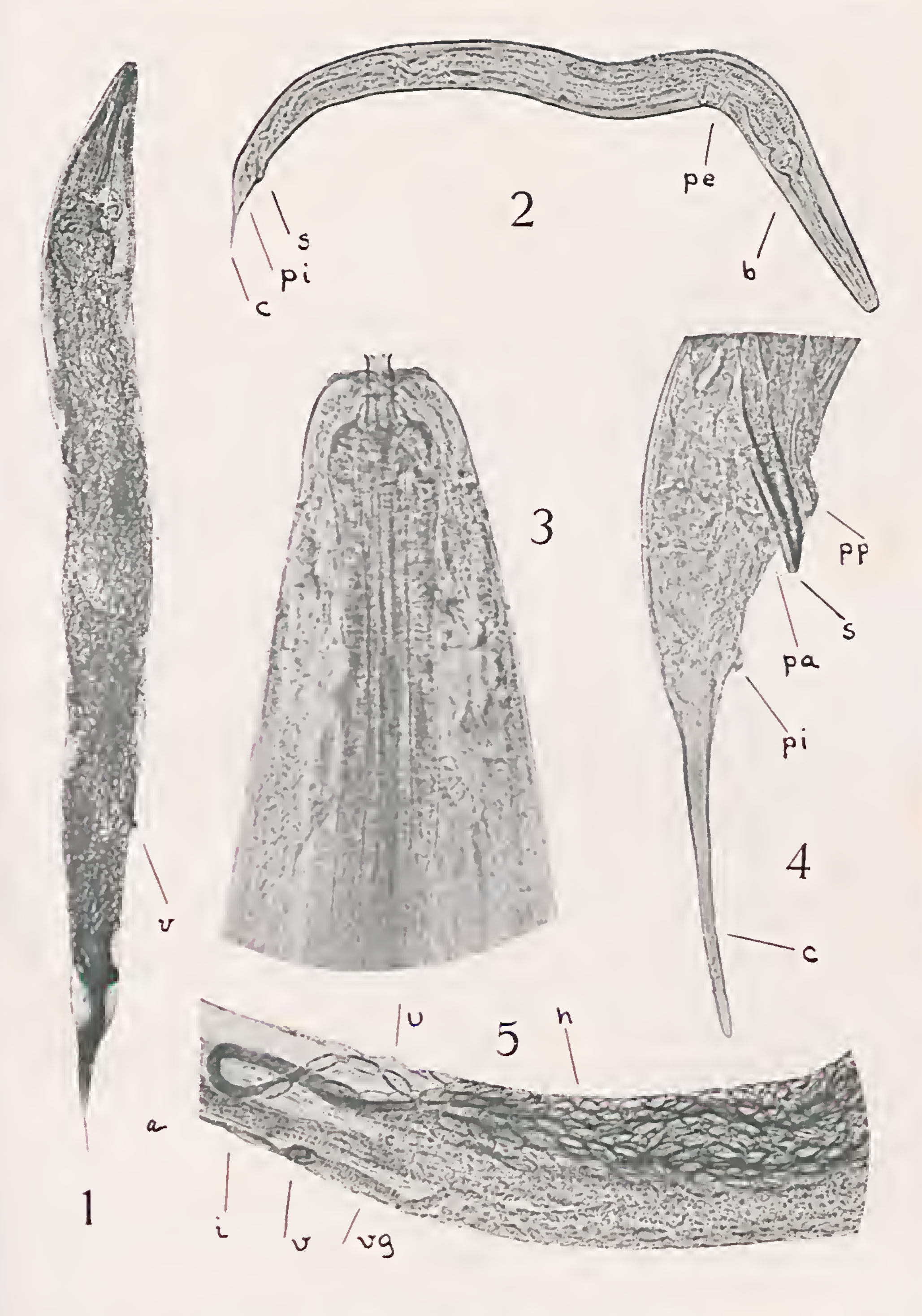
Fig. 1 — *Laurotravassoxyuris travassosi* n. sp. Hembra, cuerpo entero; a = anus, v = vulva.

Fig. 2 — *Laurotravassoxyuris travassosi* n. sp. Macho, cuerpo entero; b = bulbo, pe = poro excretor, s = espículas, pi = papila caudal impar, c = cola.

Fig. 3 — *Laurotravassoxyuris travassosi* n. sp. Extremo cefálico.

Fig. 4 — *Laurotravassoxyuris travassosi* n. sp. Extremo caudal del macho; pp. = procesos pre-cloacales con sus papilas, s = espículas, pa = procesos adcloacales, pi = papilla impar, c = cola.

Fig. 5 — *Laurotravassoxyuris travassosi* n. sp. Sección posterior del cuerpo de la hembra; v = vulva, vg = vagina, u = útero, h = huevos, i = intestinos.



Vigueras: Nematodes parasitos nuevos de Cuba.

Plancha 2

Fig. 1 — *Laurotravassoxyuris travassosi* n. sp. Extremo cefálico; cl = corona de láminas y vestíbulo oral, mostrando el anillo medio; pc = papillas circumorales.

Fig. 2 — *Laurotravassoxyuris travassosi* n. sp. Extremo cefálico, visto de frente.

Fig. 3 — *Laurotravassoxyuris travassosi* n. sp. Extremo caudal del macho aclarando la figura 4, plancha 1.

Fig. 4 — *Laurotravassoxyuris travassosi* n. sp. Aparato genital de la hembra: ov = ovarios, ovd = oviducto, u = útero, t = trompa, ovi = ovijector, vg mulo retractor de la espícula.
= vulva.

Vigueras: Nematodes parasitos nuevos de Cuba.

Plancha 3

Fig. 1 — *Travassozolaimus travassosi* n. sp. Macho, cuerpo entero; oe = oesophagus, b = bulbo, i = intestinos, pe = poro excretor, te = testículos, vs = vesícula seminal, a = alas caudales, c = cola, s = espículas, mr = músculo retractor de la espícula.

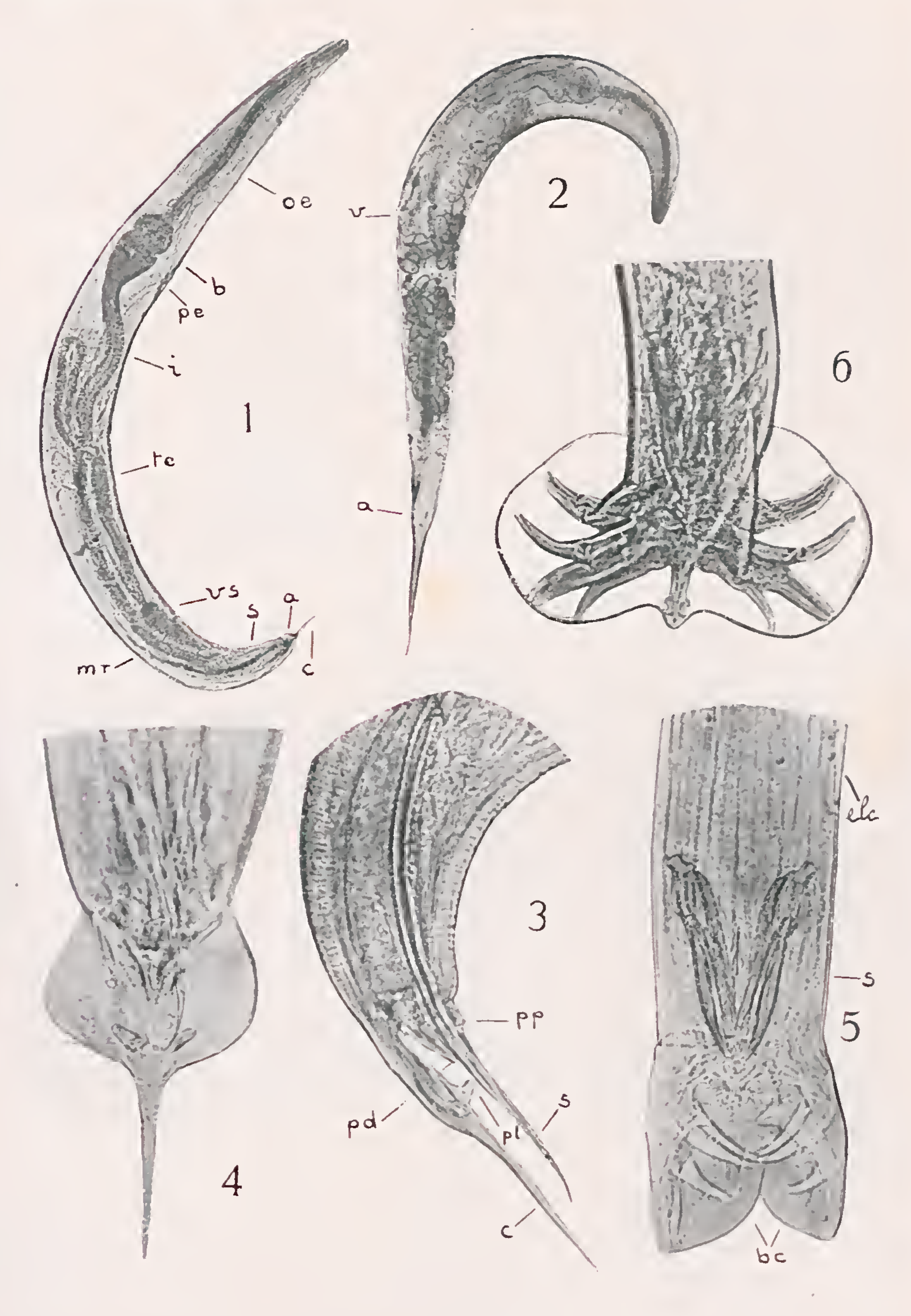
Fig. 2 — *Travassozolaimus travassosi* n. sp. Hembra, cuerpo entero; a = anus, v = vulva.

Fig. 3 — *Travassozolaimus travassosi* n. sp. Extremo caudal del macho, visto de perfil (las alas caudales laterales fueron bloqueadas); pp = procesos precloacales con sus papilas, pd = procesos digitiformes postcloacales, s = espículas, pl. = placas quitinosas caudales, c = cola.

Fig. 4 — *Travassozolaimus travassosi* n. sp. Extremo caudal del macho visto de frente.

Fig. 5 — *Oswaldocruzia lenteixeirai* n. sp. Extremo caudal del macho; elc = estriación longitudinal de la cutícula; s = espículas, bc = bolsas caudales y costillas.

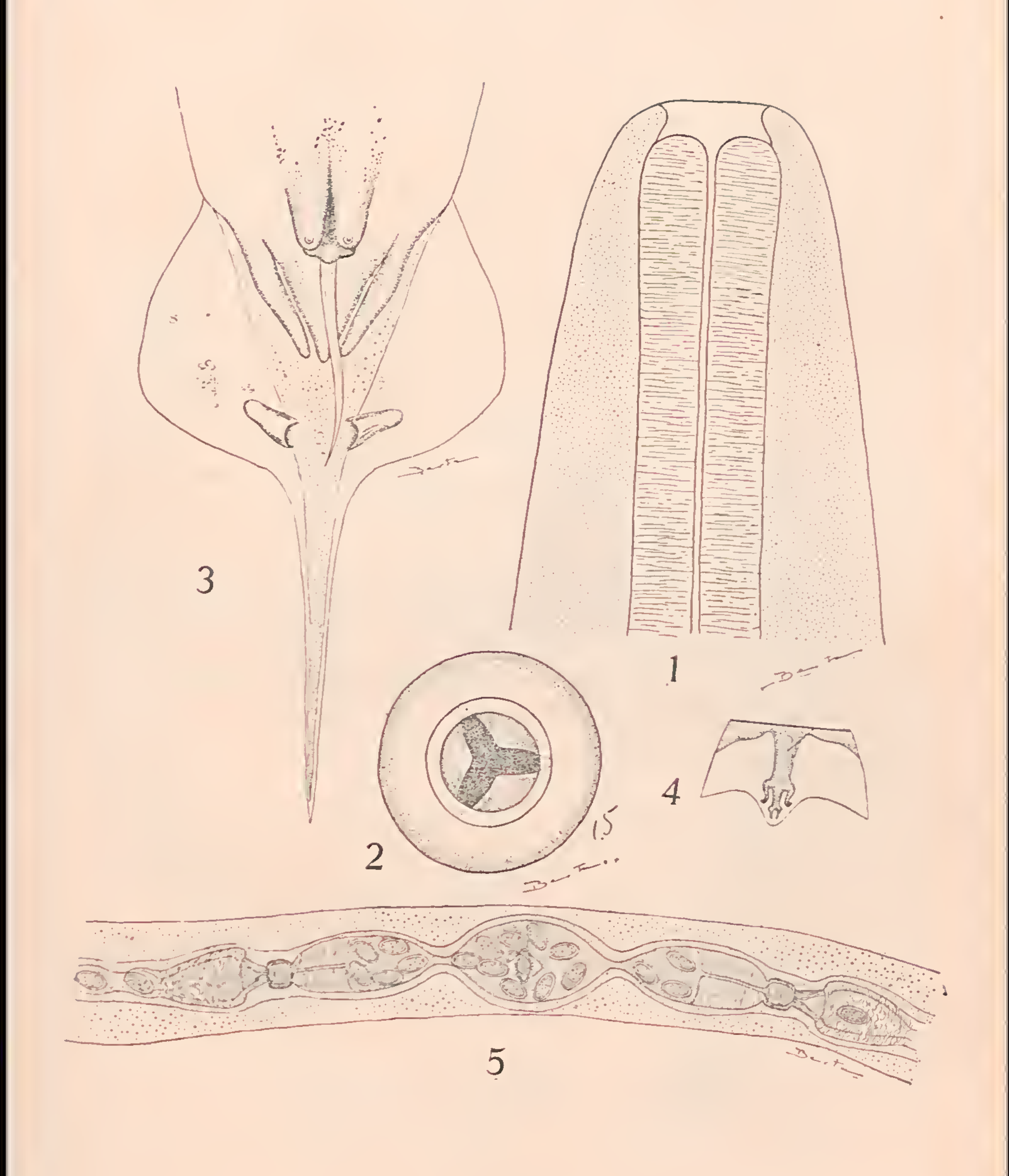
Fig. 6 — *Oswaldocruzia lenteixeirai* n. sp. Extremo caudal del macho con las bolsas caudales desplegadas. Detalle de las costillas.



Vigueras: Nematodes parasitos nuevos de Cuba.

Plancha 4

Fig. 1 — *Travassozolaimus travassosi* n. sp. Extremo cefálico visto de perfil.
Fig. 2 — *Travassozolaimus travassosi* n. sp. Extremo cefálico visto de frente.
Fig. 3 — *Travassozolaimus travassosi* n. sp. Extremo caudal del macho visto de frente, aclarando la fig. 4 de la plancha 3.
Fig. 4 — *Oswaldocruzia lenteixeirai* n. sp. Detalles de la costilla dorsal.
Fig. 5 — *Oswaldocruzia lenteixeirai* n. sp. Ovijector visto con la vulva hacia arriba, mostrando los labios anterior y posterior quitinosos, internos.



Vigueras: Nematodes parasitos nuevos de Cuba.

Plancha 5

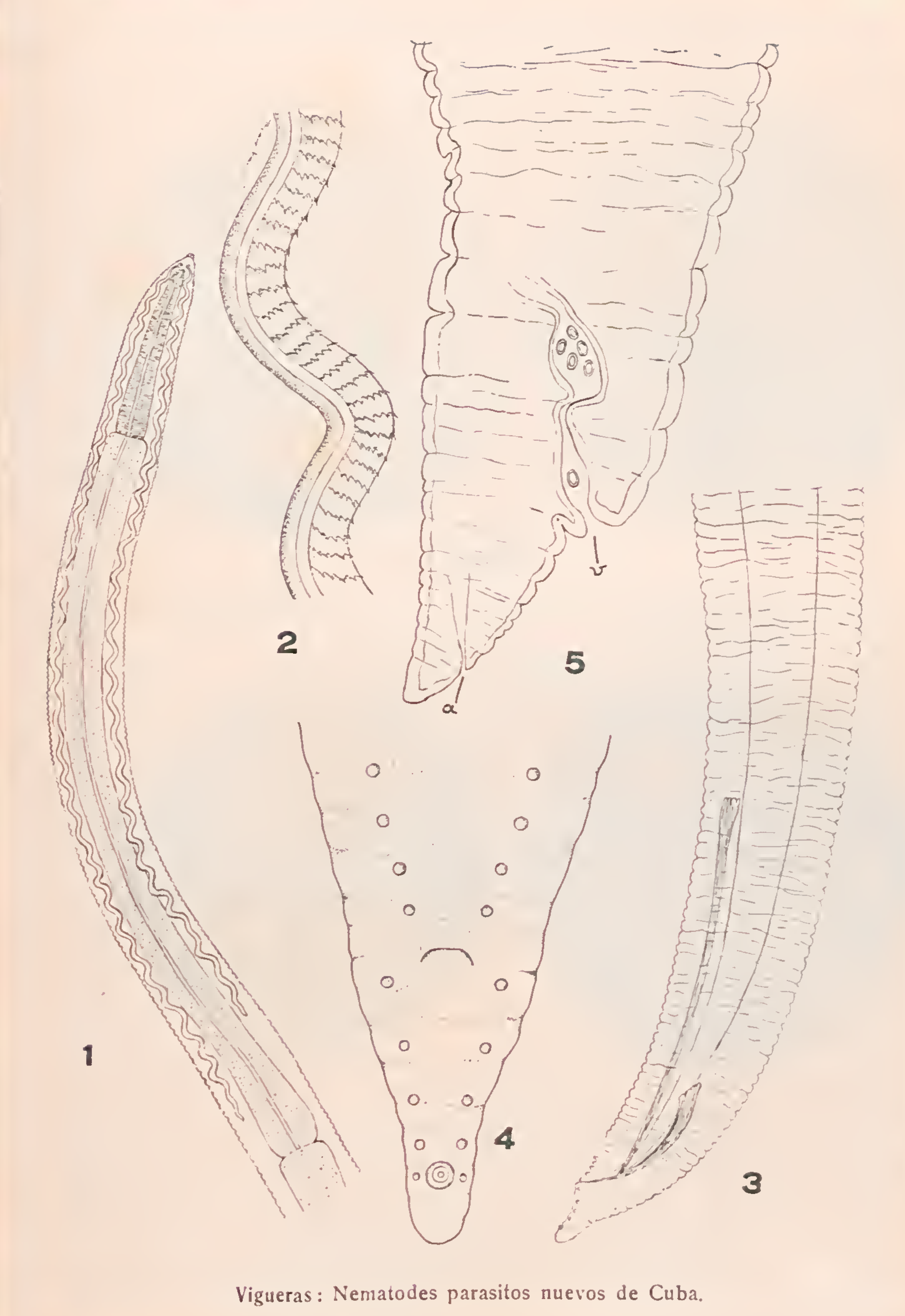
Fig. 1 — *Cheilospirura multispinosa* n. sp. Región anterior del cuerpo mostrando las papilas, los eosophagus y los cordones.

Fig. 2 — *Cheilospirura multispinosa* n. sp. Fragmento de cordón con los detalles de su estructura.

Fig. 3 — *Cheilospirura multispinosa* n. sp. Extremo caudal del macho visto de perfil, detalles de las espículas, papilas caudales y punta de la cola.

Fig. 4 — *Cheilospirura multispinosa* n. sp. Extremo caudal del macho visto de frente, disposición de las papilas.

Fig. 5 — *Cheilospirura multispinosa* n. sp. Extremo caudal de la hembra; a = anus, v = vulva.



Vigueras: Nematodes parasitos nuevos de Cuba.

Plancha 6

Fig. 1 — *Laurotravassoxyuris travassosi* n. sp. Huevos, mostrando los largos cordones polares.
Fig. 2 — *Travassozolaimus travassosi* n. sp. Huevos.
Fig. 3 — *Oswaldocruzia lenteixeirai* n. sp. Huevos.
Fig. 4 — *Cheilospirura multispinosa* n. sp. Huevos.



Vigueras: Nematodes parasitos nuevos de Cuba.

On the Genus Deropristis and the Acanthocolpidae

(Trematoda)

Henry B. Ward
University of Illinois — U. S. A.

[With 3 plates]

Some time ago while studying a large collection of Trematoda from North America I found specimens belonging to the genus *Deropristis* Odhner, 1902. A cursory examination of the literature indicated that some confusion existed not only in the genus itself but also in the family and I was led to review the topic more carefully. My own extensive collections, supplemented by specimens from colleagues at home and abroad, supplied materials for comparisons essential to determine actual facts and clear up much of the confusion existing. The results of this study are presented here.

The genus *Deropristis* was established by Odhner (1902) to include two long known species, viz. *Distomum hispidum* Abildgaard and *D. inflatum* Molin. Odhner's conception of the features common to the two species which he selected as generic characters may be summarized briefly as follows:—

Distomes: small, elongate, narrow, with weak musculature. Anterior region expanded, with thickened margins and median dorsal hump. Entire body armed with long pointed spines, heaviest on margins of anterior expansions and on dorsal hump. Spines caducous, and apparently variable. Suckers small and weak. Prepharynx, pharynx and esophagus present, not large; crura extend near lateral margins to posterior end. Excretory bladder Y-shaped; unpaired stem short, branches long. Two oval, elongate, smooth marginal testes tandem near posterior end. Ovary spherical near center of body; capacious receptaculum seminis near by as also shell gland complex and Laurer's canal. Vitellaria with numerous small follicles, lateral, from seminal vesicle to anterior testis. Uterine coils between anterior testis and seminal vesicle. Sex pore median, at anterior margin of acetabulum. Ova numerous, small, 38 to 48 microns long. Type species, *D. hispida* (Abildgaard).

HOSTS:— Migratory fish: eel and salmon, various species.
HABITAT:— Marine.

Rudolphi first described the species *Distomum hispidum* and cited (1819 : 118) Abildgaard as authority for the name. Odhner recognized Rudolphi as author because he was the first to give a diagnosis of the parasite. Some later citations follow Odhner in this. However, Rudolphi credited the name to Abildgaard and the first description carried that heading so any change does violence to the original publication which I follow in this article.

In the succeeding fifty years many writers referred to the species or recorded its occurrence in some new region or host but added little to the account of Rudolphi. Indeed the parasite was so little known that Cobbold under the name *Echinostoma hispidum*, which was supposably Rudolphi's *Dist. hispidum*, described and figured an entirely different parasite of the salmon.

Distoma inflata was originally described by Molin (1859 : 826) from specimens taken from the stomach of the eel at Padova in December. The description though brief is sufficient for recognition of the parasite. Yet it appears not to have been sufficiently precise to give later students an accurate idea of the form described.

In 1868 Olsson published the second account of this species which he collected at Bergen. He studied it living and commented on its bright yellow color and its extreme mobility. The account is much fuller than Molin's and covers fairly the external spination and the internal structure of the worm. Olsson published with this paper four figures representing the parasite and details of structure. Unfortunately this account did not become widely known and was entirely overlooked for some time.

Van Beneden in his studies on the fishes of the Belgian coast and their parasites (1870) lists *Echinostoma hispida* Abildgaard as very common in the sturgeon. He figures what he considers old and young stages and comments on their presence by thousands in the stomach and intestine of a sturgeon no more than a foot long. The « young stage » is figured with the characteristic Echinostome cephalic crown of spines and can hardly belong to the genus *Deropristis*. It is probably some other sturgeon parasite. He mentions also a parasite very similar if not identical in the eel from Ostend. Nevertheless it is likely he had the true *Deropristis hispida* from the sturgeon as he comments on the appearance of the anterior end as like the head of the cobra. This expression portrays strikingly the appearance of the true *Deropristis*. The large amount of material in my hands justifies the direct statement that this species does not undergo any such considerable change in appearance in its growth as Van Beneden suggested. Specimens with few eggs are almost exactly like those filled with eggs except in the size of the post-acetabular region. The spines of the anterior region never in all the specimens I have examined showed any such crown of heavy spines as Van Beneden has figured for the young stage. It is not necessary to discuss further the other features of the illustration which do not conform to the true *D. hispida*.

On the other hand the figure labelled *Echinostoma hispida* which is described as sexually mature, filled with eggs, and found in the intestine of an eel taken at Ostend, is probably *Deropristis inflata*. In fact Van Beneden stated in the text where the species is listed as parasite of *Anguilla vulgaris*,

> « Ce Distome nous parait semblable, s'il n'est pas identique, à l'espèce de l'Esturgeon. Mon fils l'a observé à Ostende, au mois d'avril. Il faudra voir si ce n'est pas le même que Molin a nommé *D. inflatum* et que P. Olsson a trouvé également à Bergen ».

He was probably right in his surmise that the form he had was Molin's species which Olsson had described in 1868. But he erred in regarding the

two forms he found in sturgeon and eel as identical and stages in growth of the same species.

Thus it seems probable that Van Beneden had both species before him.

Stossich (1885) discussed both species. For *Dist. inflatum* he added to Molin's description some important details and published a figure that unfortunately fails to represent well both the external and internal characteristics of the species. In a series of later contributions on the parasites of the Mediterranian region Stossich added further data on this species yet Looss (1899) found the descriptions and figures available at that time inadequate for a precise determination of the position and relationships of this species. While references to this species by name are made by several investigators between Molin and Looss, these comments include only scattering data and some indeed probably do not concern the true *D. inflatum*.

The situation was cleared up by Odhner's paper (1902) already referred to. At first he doubted the specific identity of the form Olsson found on the Swedish coast with Molin's form from the Adriatic. But his examination of the original material which Olsson had presented to the University Museum at Upsala disclosed no material differences between these and specimens collected by Stossich at Trieste from the eel (*Anguilla vulgaris*). This not only established the specific identity of the forms from these widely separated regions but also demonstrated than the same species, *Deropristis inflata* may occur both in the eel and in the sturgeon. Since the date of Odhner's paper only one important contribution has been made on either species in Europe. Markowski (1933) describes *D. inflata* from *Anguilla vulgaris* taken in the Polish Baltic. Neither the figure he gave nor the description agree in all respects with the data presented by Odhner: thus the testes differ conspicuously in size and position and other minor differences are evident. But the general similarity justified assigning them to the same species.

The first reference to *Distomum hispidum* Abildgaard in North America was made by Leidy who reported (1887) in a single paragraph that he had obtained many specimens from the intestine of *Acipenser sturio* of the Delaware River at Philadelphia. Pa. His description though brief is sufficient to place the parasites he had in the genus *Deropristis*. Material I have studied from the Leidy collection confirms his view that they belong to the species *D. hispida*. Stiles & Hassall (1894) appear to have listed the species without further study on the basis of Leidy's determination. Linton (1901 : 478) described a parasite of the hake under the name of *Distomum hispidum* Abildgaard which certainly is not the same as Leidy's species or as the European form of that name.

Pratt (1902 : 897) included the genus *Deropristis* in his key to North American Trematodes but unfortunately the brief description (p. 955) taken from Linton does not apply to the genus as established by Odhner and he does not cite Leidy's record. Stafford (1904) in a list of trematodes from fishes in Canada recorded *Deropristis hispidus* [*sic*] Abild. from the lake sturgeon and *D. inflata* Molin from the eel, but included no data as to locality or measurements of organs. For his « *D. hispidus* » Stafford gave a description from which it is in my opinion safe to assert that he did not have the true *D. hispida* before him. He stated « ventral sucker rather smaller than oral » whereas Odhner advanced the opposite opinion and my measurements

given in this paper confirm Odhner's view. Stafford's brief statement regarding the spines does not agree at all with the facts as given by several previous writers, and more significant still he failed to mention the lateral expansions of the forebody with marginal rows of heavy spines or the dorsal hump with large flat scales though these are most conspicuous features of *Deropristis* and are mentioned even by Rudolphi in 1819. Finally Stafford stated that folds of the uterus fill the space between the two testes «even lapping down the sides» of the posterior testis. In fact there is no space between the two testes and the uterine folds do not pass beyond the anterior margin of the anterior testis. Stafford's form does not belong to the species *hispida* or even the genus *Deropristis*! This record should be canceled both as to name of the parasite and occurrence of *Deropristis* in the lake sturgeon. I have a parasite taken from that host which is close to Stafford's form if not identical with it and I shall return to a consideration of its character in a later paper. In 1918 (Ward & Whipple) I called attention (p. 392) to Stafford's record and its uncertain character which led to its omission from the key in that book; further studies have fully established the surmise expressed there.

In the same paper Stafford (1904) lists *Deropristis inflata* Molin from the eel. No locality is given nor any description of the parasite save the size which is in general agreement with the size of *D. inflata*. However in the absence of further data the record can not be regarded as finally established. Manter (1926 : 110) who studied specimens in my collection, confirmed their agreement with Odhner's *Deropristis inflata* (Molin).

DATA ON THE STRUCTURE OF *DEROPRISTIS*.

In my collections here are many specimens of *Deropristis* which represent a wide range of distribution. These include the following:

1. *Deropristis inflata* (Molin). Alcoholic specimens sent by Dr. A. Looss from Cairo, Egypt in 1908. These are labeled *Int. ten. Anguilla vulgaris*. Triest.
2. *Deropristis hispida* Abildg. Alcoholic material and mounted specimens from the Leidy collection loaned for study. These were obtained in the intestine of a sturgeon from the Delaware River, at Philadelphia at a date not given, and described by Leidy in 1887.
3. *Deropristis inflata*. Collected at Woods Hole, Mass., July 25, 1913. From the intestine of *Anguilla rostrata*.
4. *Deropristis inflata*. Collected at Woods Hole, Mass., July 20, 1916. From *Anguilla rostrata*.

A detailed description of the two species is unnecessary in view of accounts given previously. It is appropriate to comment on some features that have been only partly worked out or on which new evidence has been secured.

Previous students have paid especial attention to the spination of these parasites, and have described at length the varieties of spines and scales present as well as their abundance and distribution. The different accounts are at variance with each other. Odhner stated that previous descriptions were at fault in certain respects. On the other hand the various types of these structures and their general distribution were correctly described and illustrated by Olsson

who seems to have been the only writer having made an extended study of the living worm. The explanation of the discrepancies in descriptions of the spination was given by Creplin in 1828 who according to Braun (1892 : 329) devoted a chapter to the ease with which the spines of *Dist. hispidum* are lost. Olsson also stated that the large spines may easily be lost since on specimens collected at Warberg which certainly belonged here, he was not able to find any. In the material at my command not a single specimen had apparently more than a small part of the original coat of spines. Consequently I deem it unwise to attempt to describe in detail the spines in either species or the possible differences between the species in this feature. This study must profitably await the opportunity afforded by an abundance of living material.

However some main features of the spination may be noted. The entire body is covered by close set rows of sharp pointed spines largest in the middle of the forebody, becoming smaller and more delicate towards both ends and disappearing near the testis. Flat, heavy, ovate spines occur in rows on the margins of the inflated anterior region and still heavier scales occur on the dorsal hump. All spines are larger and more conspicuous on *D. hispida* than on *D. inflata*. In neither case could the exact number and arrangement of the larger spines be determined. That the spines on the exterior of the body are not duplicated by the structures found in the genital ducts was recognized by Olsson who included drawings of dermal spines and also of the two special types, naming the large neck spines « echini colli », and the genital type « pili penis ». In preserved specimens the external structures are firm, regular and evidently hard, as their form is maintained under all conditions whereas those on the walls of the metraterm and cirrus are often bent in varying degree, and irregular in position. They also differ in optical qualities and in affinity for stains. Some conditions convey the impression that the genital spines are flexible rather than unyielding in character. The flattened, lancet-like form hardly agrees with the name of « hairs » given them by Olsson who thought them bifid; later writers are a unit in calling them spines. However, it is clear that they are in nature different from the dermal spines found in this species.

MEASUREMENTS OF ALCOHOLIC SPECIMENS

Specimens of *D. hispida* from the Leidy collection gave the following results: Length 1.9 to 5.9 mm. with an average of 1.3 mm. Of this total the distance from the anterior margin to the acetabulum varied from 0.17 to 1.21 mm., averaging 0.76 mm. This is the most mobile part of the body. From the anterior tip to the ovary the measurement ran from 1.8 to 4.8 mm. with an average of 2.9 mm. The interval between the head end and the anterior testis varied in length from 2.67 to 5.25 mm., averaging 3.7 mm. As the material had been in alcohol many years, most specimens were distorted and all specimens could not be used in all these calculations. However, the number used was large enough to justify the average.

The maximum width of the body varied in different specimens from 0.17 to 0.61 mm., with 0.37 as the average. The oral sucker measured from 0.08 to 0.22 by 0.08 to 0.21 mm., or on the average 0.12 by 0.12 mm. The

acetabulum ranged from 0.1 to 0.21 by 0.11 to 0.22, averaging 0.15 by 0.15 mm.

The ovary measured from 0.12 to 0.41 by 0.12 to 0.36 mm., averaging 0.26 by 0.19 mm. The anterior testis was 0.28 to 0.54 mm. long by 0.15 to 0.31 mm. wide, or on the average 0.45 by 0.25 mm. The posterior testis measured 0.31 to 0.56 mm. long by 0.17 to 0.36 mm. wide, averaging 0.50 by 0.25 mm. Since these organs were not so often distorted in the alcoholic material, the averages represent a much larger number of individuals than could be used for measurements of length and width.

Ten specimens which had been selected for their relatively excellent condition and mounted some years ago in balsam were then measured carefully and in the same manner as the series just reported. The averages in this group did not depart significantly from those given above at any point but in most cases were somewhat larger.

Comparing these measurements with those given by Odhner (1902) for *Deropristis hispida*, one notes that the American form is only half as long (5.9 : 12 mm. maximum) and relatively a little wider (0.4 : 0.65 mm. maximum). The oral sucker is smaller (0.12 : 0.17) and the ventral also (0.15 to 0.19) although here the range I have recorded for these organs in Leidy's specimens surpasses the minimum given by Odhner for *Deropristis hispida*.

The eggs from the Leidy material measured from 36 to 45 by 16 to 25 microns. Odhner stated that ova from his material measured circa 38 to 43 microns long. All things considered it seems just to conclude that although the worms are only about half as long, they most probably represent the same species as that found in similar hosts in Europe, namely *Deropristis hispida*.

The specimens in my collection representing *D. inflata* which had come from Looss were in especially fine condition. The number was large enough to represent fairly the range that one would find in a more extensive collection. The figures obtained are valuable for comparison with the other material represented here. The length of the Looss specimens varied from 0.78 to 3.68 mm. with an average of 1.62 mm. The maximum width ranged from 0.1 to 0.24 mm., averaging 0.15 mm. The oral sucker measured on the average 0.08 by 0.08 mm. and the ventral 0.1 by 0.09 mm. The ovary measured 0.09 by 0.07 on the average and the testes 0.13 by 0.08 mm. The eggs range from 43 to 49 by 23 to 27 microns with an average of 45 by 25 microns, being thus slightly larger than those of *D. hispida* although the range in one species overlaps that in the other.

Comparing these measurements for *D. inflata* with those given above for *D. hispida* one finds a marked difference in the size of the parasite and of the organs mentioned. Specimens of *D. hispida* are in all measnrements made considerably larger than *D. inflata* and the differences are too great to be explained as factors of different ages. Also the reverse relation obtains between the ova of the two species and these are not subjected to variation with growth of the parasite. Thus the data secured by this series of measurements fails to support the view advanced by Van Beneden that the parasites he found in the eel and the sturgeon though of different ages are identical. This item is important since Braun (1892 : 567) maintains that among distomes changes in form appear at different ages which are so far reaching that transi-

tion stages are often necessary for the diagnosis of the young form. As the first, and prominent example of such a condition he cited *Dist. hispidum* Abildg. according to Van Beneden (1870 : 23). This view is quoted by Manter (1926 : 29) as if it were in this species an established fact. Without prejudice to the general statement I wish to point out that this example at least is based on a probable error of Van Beneden.

These data throw some light on the true value of measurements of such forms. I have found frequent descriptions in which only a single measure was set down for the parasite sometimes with equally precise figures for some organs. Such figures indicate a desire to give an exact mathematical expression to an object that in its nature is inexact. The citation of a definite size for a species or its organs overlooks the facts of age, state of contraction, individual variation and, when preserved material has been under consideration, the influence of reagents also. To present a correct picture of such soft-bodied organisms it is essential to indicate the range of measurements as well as the age and condition of material studied. However, it is equally unfortunate to find dimensions expressed in figures that exceed the possible accuracy of the apparatus employed or the personal error of the observer involved. Outside of such purely mechanical factors a rich field is open for investigation of host influence on the growth of the parasite.

THE FAMILY *ACANTHOCOLPIDAE*

Lühe (1906) established a new sub-family, *Acanthocolpinae* to accommodate a new genus and species *Acanthocolpus liodorus* from the intestine of *Chirocentrus dorab* in Ceylon. With the new genus he associated *Stephanochasmus* Looss and *Deropristis* Odhner. Looss suggested a fourth genus to be based on *Distomum osculatum*. This proposed genus was published much later by Poche (1926) who designated it *Tormopsolus*. Before that Lühe (1909) had created the family *Acanthocolpidae* and the sub-family received no further notice. To the family Poche assigned further the genera *Dihemistephanus* Looss and *Acanthopsolus* Odhner. The detailed structure of *Dihemistephanus* is now much better known thanks to a paper by Little (1930) and this genus fits well in a group with the other four older genera, well defined by Lühe's earlier characterization of the sub-family *Acanthocolpinae*.

The most striking difference between *Acanthocolpus* and the four older genera is in a real sense clearly superficial, but it deserves specific mention since the genus is the type of both family and subfamily. Lühe in his provisional generic diagnosis stated «without spines in the skin and around the mouth». All the other genera agree in having a highly developed spinous covering of the body with large and prominent circles or groups of heavy spines or scales in some particular region. As has been already emphasized in discussing *Deropristis* these spines are very easily lost and do not constitute as safe character for diagnosis. It is even possible that the study of fresh material will demonstrate the presence of spines on the skin of *Acanthocolpus* as well as in organs noted by Lühe. See Olsson's comment on spines in *D. hispida*. Yet the agreement in other organ systems is so clear that even the absence of external spination if confirmed would not justify placing the genera

Acanthocolpus, *Deropristis*, *Dihemistephanus*, *Stephanochasmus* and *Tormopsolus* in separate families.

Acanthopsolus appears to me to be doubtfully entitled to a place in this family. In fact it disagrees with the diagnosis drawn up by Lühe in many significant features with which all others are in agreement. Although generally spinous the body shows no tendency to specialization of spiny regions, as around the mouth (*Stephanochasmus*) or on marginal expansions (*Deropristis*). The body is generally spinous as are the copulatory organs but not in the manner of other genera of the family. The body is pyriform with fairly well differentiated regions as Odhner shows, instead of being band-like. Ovary and testes are grouped together, vitelline follicles are large, ova few and conspicuously large. Indeed the diagnosis of the genus *Acanthopsolus* as drawn up originally by Odhner (1905 : 331) differs somewhat in almost every item and often conspicuously from Lühe's diagnosis of the family *Acanthocolpidae* (1909 : 84). It is even more widely at variance with the diagnosis of the family as given by Fuhrmann (1928).

Nicoll's suggested grouping (1915 : 344) of *Stephanochasmus* and *Acanthopsolus* as a sub-family *Stephanochasminae*, is subject to exactly the same criticism since *Stephanochasmus* agrees well in structure with the diagnosis of the family *Acanthocolpidae* and with the other genera included by Lühe and Poche whereas *Acanthopsolus* does not. Nicoll's view that these forms are to be attached to the *Allocreadiidae* has not found general approval.

At first Lühe established only a sub-family *Acanthocolpinae* with the three genera *Acanthocolpus*, *Deropristis* and *Stephanochasmus*. To these Poche (1926) following the brief suggestion of Odhner (1910), added *Dihemistephanus* Looss, *Acanthopsolus* Odhner and *Tormopsolus* Poche. The first and last of these three fall well within the limits of the sub-family as set by Lühe, but this is not true of *Acanthopsolus*. Hence it seems wise to establish a new sub-family for that genus with appropriate characteristics which I propose as follows:

Acanthopsolinae sub-fam. nov.

Body pyriform, anterior region narrower, posterior region broader and thicker; spination generally uniform with spines largest near anterior end and becoming slenderer and smaller posteriad but without conspicuous groups of spines in any area. Uterus short, eggs large and very few in number.

The establishment of this new sub-family will call for appropriate changes in the definition of the family but these I defer for the present in order to include them in a discussion of some new American species which may well demand the introduction of other new sub-families in this circle.

While this group is small at present, including only six genera at most, other proposed genera have been evaluated as synonyms, viz. *Neophasis* Stafford as a synonym of *Acanthopsolus* Odhner and *Lechradena* Linton as a synonym of *Stephanochasmus* Looss. In addition there are several other imperfectly known forms which may well be included here and these will be treated in another paper. The known forms are all marine, found only in migratory fish exceptionally in fresh water bodies. The few species thus far recorded come from the Arctic, from temperate seas and from the tropics.

This wide distribution and the present limited knowledge of marine fish parasites suggests a considerable expansion of the group as studies are extended. The *Acanthocolpidae* are most closely related to the *Echinostomidae* a family that has been conspicuously increased in numbers and breadth by recent researches.

In a recent extended study on fish parasites of Japan, Yamaguti (1934) devoted one section to the *Acanthocolpidae*. He found in Japanese waters two species of *Stephanochasmus* (one new), one new species of *Tormopsolus* and one new form for which he also created a new genus for *Echinostephanus hispidus* n. g., n. sp. This last mentioned form demands further consideration. Details of its structure and measurements are recorded very fully. As a basis for distinguishing it from allied forms Yamaguti listed.

(1) « the greatly elongated shape of the body »,
(2) « character of cephalic and integumentary spines »,
(3) « the cecal connection with the excretory bladder », and
(4) « the excessive length of the cirrus pouch ».

A careful review of data he gave shows the following:

(1) This parasite measured 6.8 to 9.8 mm. in length by 0.52 to 0.62 mm. in width; but this is less than corresponding dimensions for *Deropristis hispida* according to Odhner and for some other species of the family.
(2) I have read his description of the spines with great care and find it fuller and more exact than that given by most previous workers but fail to see any significant feature on which to base a new genus or even a new species.
(3) The connection of the digestive ceca with the excretory bladder is a most interesting morphological and physiological character. Yamaguti pointed out that only recently such a union had been demonstrated in numerous trematodes and occurred « spasmodically » in different families and even genera « so that two much importance should not be ascribed to the presence of a cloaca from the taxonomic point of view ». With this I heartly agree.
(4) The cirrus pouch is not longer either relatively or absolutely in Yamaguti's species than the same organ in some *Deropristis* specimens.

Summing up the factors involved and the close resemblance in organs throughout one must conclude that this new genus must be justified on the basis of size which is regularly only a specific distinction, or because a cloaca is present and Yamaguti himself stated that was inadequate. Hence I am clear myself that this parasite does not justify the formation of a new genus but must be referred to one of those already existing in this family. It certainly looks much like an attenuated *Stephanochasmus* and provisionally should be placed in that genus to which moreover Yamaguti stated it was most closely affiliated.

In selecting a sub-family in which to place this new genus Yamaguti

decided upon Nicoll's *Stephanochasminae*. This group was never fully defined by Nicoll and as Poche has set forth is not a natural group nor even in a proper association as part of the *Allocreadiidae* in which Nicoll included it in his list. Furthermore the subfamily *Acanthocolpinae* established by Lühe in 1906 antedates Nicoll's by nine years and has been recognized by Poche and others as an effective grouping of *Stephanochasmus* and other genera, as I have already shown. The structure of his new genus as defined by Yamaguti agrees in full detail except for the presence of a cloaca with the diagnosis of the subfamily *Acanthocolpinae* as given by Lühe (1906).

Structarally the family *Acanthocolpidae* is closely related to the *Echinostomidae*. While the former is as yet much less well known in that fewer species have been reported, it is also clear that these few species manifest wider variations in structure and are more generalized. On the other hand the Echinostomes appear to be a more highly specialized group. This difference is evidenced in several directions. The prominent character of Echinostome structure is the ruff or collar about the oral sucker, bearing a set of hooks differing precisely in form, arrangement, and number with different genera and species. In the *Acanthocolpidae* somowhat similar sets of hooks may be present but the collar is lacking and the hooks more variable. The forebody is shorter, the organs more condensed, there appears less variation in the position of organs, the uterus is short, limited to the space between ovary and acetabulum, the ova scanty in number but much larger and abundantly supplied with yolk so that the stay in the parental body is short since most development takes place outside. In the Acanthocolpid the eggs are much more abundant in most species and of smaller size. The uterus is always larger but varies considerably in different groups. Sometimes it is limited to the space between the ovary and the acetabulum *(Stephanochasmus)* but increases its extent by forcing its coils backwards between the ovary and the anterior testis. Finally it spreads further over the testis into the extreme posterior end of the body. All these differences in the extent of the uterus appear within the range of the simple genus *Stephanochasmus*, except the final stage in *Distomum semiarmatum*.

GENERAL CONCLUSIONS

From the study of many specimens I am led to comment on the value of various structures as criteria for differentiation of genera and species. Though applying particularly to this group of trematodes my studies convince me of the wide application of these findings to other trematode families. Long ago Looss emphasized the need of precise fixation to avoid errors in descriptions made from preserved material. The specimens available for my study were obtained under diverse circumstances and preserved by different methods. They show even in the same lot widely variant sizes, and shapes for the same species. The differences in many specimens are greater than those utilized by some writers in distinguishing different species. These Trematoda have no hard parts save the spines. What of the relative value of various structures?

The anterior region or forebody is thin and extremely mobile; it varies in length by several fold depending on stage of contraction. The width of the forebody depends somewhat on age, increasing in older specimens, but it is

more radically changed by ventrad folding of the edges which gives this region a ventral furrow, indicated in Pl. 1, fig. 1; this stops just in front of the acetabulum, i. e. at the sex pore. The condition suggests strongly the initial stage of the schistosome gynecophoric canal to which it may well be analogous.

The hind body is thick, heavy and shows little mobility in the adult but it increases markedly in length and weight from the earliest form to full maturity (cf. Pl. 1, figs. 1 and 2). Nevertheless one finds differences in proportions between strongly contracted and fully extend specimens. Such contractions, caused by preserving fluids, induce changes in the spacing of organs, in density of follicles or spines and in the shape of organs to a slight extent, but the size of ova, spines, and follicles (Pl. 2, fig. 2) and of organs vary only slightly and that with functional activity.

Accordingly one must regard as unreliable specific characters, precise measurements of length and breadth of the body and exact distances between various organs, or of regions like the prepharynx, esophagus, etc. More extended studies on living specimens available in large numbers are needed to show fully the limits within which these data may vary in active specimens. In some trematodes the changes are slight as I found years ago when studying 2,500 specimens of one form obtained from a single host at one time. But in the *Acanthocolpidae* one finds the opposite extreme.

In the past much attention has been paid to the spination. If the material available consisted of living specimens in fresh uninjured condition the spines might be useful characters for specific diagnosis, and the distribution and variation correctly determined might prove useful for distinguishing genera. However, they are easily lost and in no case have I found a preserved specimen with more than a fraction of its complete armament. Much more useful as species characters are measurements of internal organs and their relation to each other, especially the genital organs. These are of a type well described by Lühe and Odhner and recognized as generic in value in this family. The long tubular or sacculate genital atrium followed by a similarly elongated cirrus with cirrus sac and metraterm are conspicuous features in the family of the *Acanthocolpidae*.

Further discussion of these principles will be given in another paper on some allied trematodes which will be published shortly.

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Plate 1

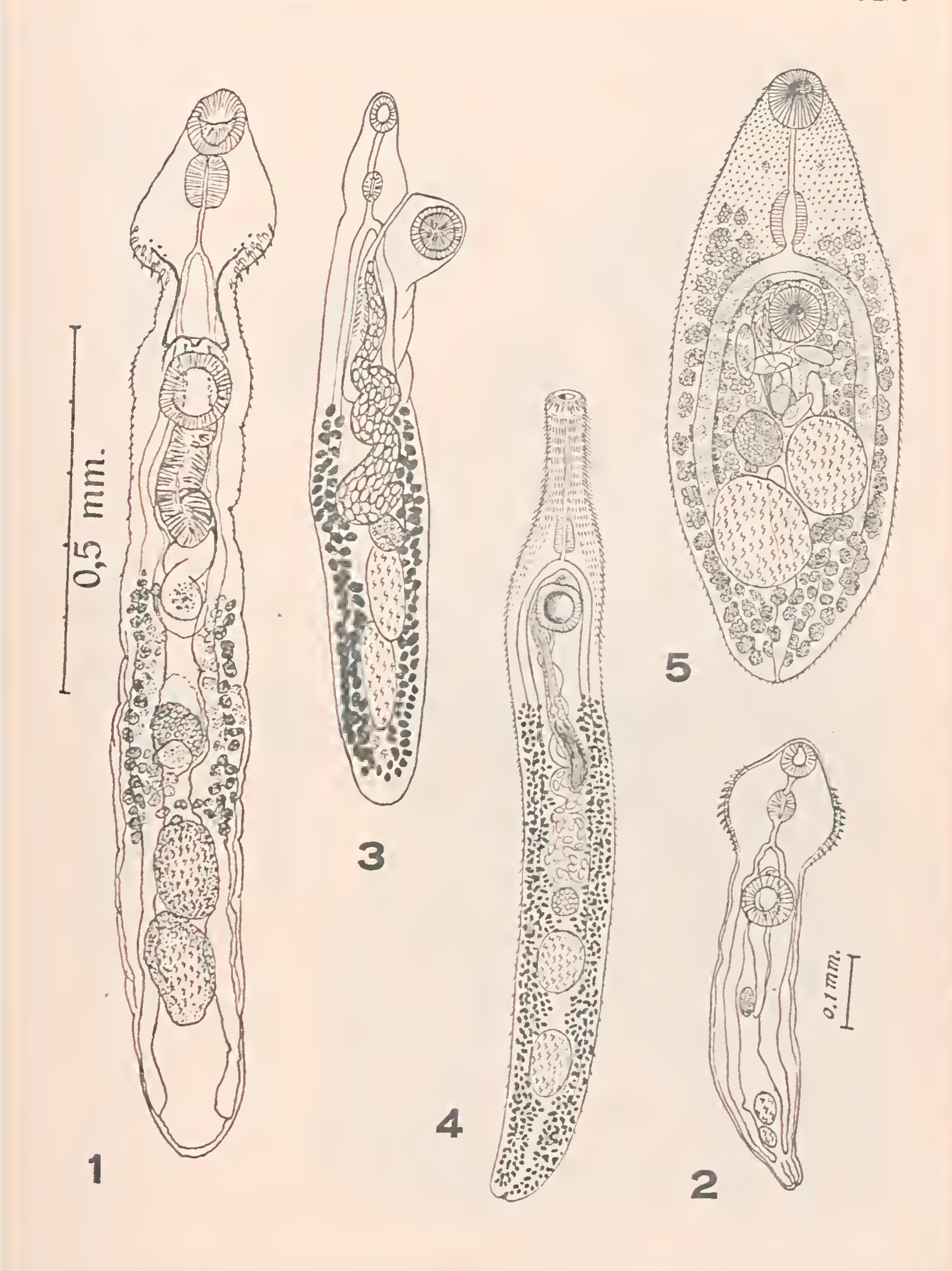
Fig. 1 — *Deropristis inflata* (Molin); moderately full grown specimen, from eel at Woods Hole, 1916. Ventral view. Original.

Fig. 2 — *Deropristis inflata* (Molin). Very young specimen from eel. Collect by Looss. Sex organs only starting to develop. Anterior region somewhat contracted. Original.

Fig. 3 — *Acanthocolpus tiodorus* Lühe, 1906. Type species of genus and subfamily. After Lühe, 1906, Plate 1. figure 7.

Fig. 4 — *Stephanochasmus cesticillus* (Molin). Type of genus; after Looss, 1901, fig. 1, p. 599. Magnification about 13.

Fig. 5 — *Acanthopsolus oculatus* (Levinsen, 1881). Type species of genus; after Odhner, 1905, Plate 2. figure 11. Magnification about 65.

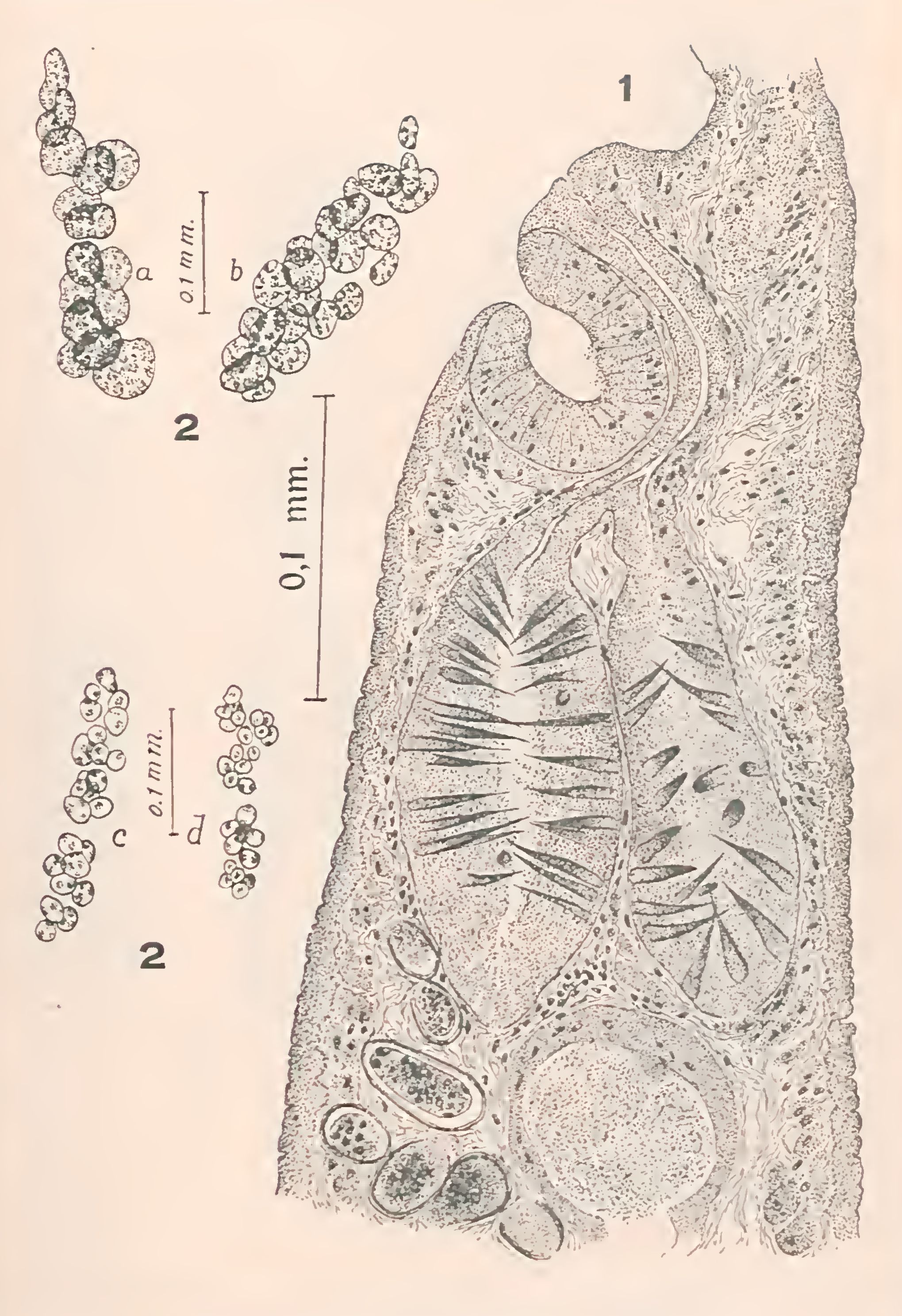


Ward: On the Genus *Deropristis* and the *Acanthocolpidae*.

Plate 2

Fig. 1 — *Deropristis inflata*. Longitudinal section through genital pore, showing short unarmed genital sinus, metraterm and cirrus with spines, vesicula seminalis, and ova in distal end of uterus (wall not crearly defined). Specimen of eel at Woods Hole, 1913. Original.

Fig. 2 — Camera sketch of vitelline follicles from specimens of *a*, *b*, *Deropristis hispida* from sturgeon, Leidy collection; *c*, *d*, *Deropristis inflata* from eel at Woods Hole, 1913. All at same magnification. Original.



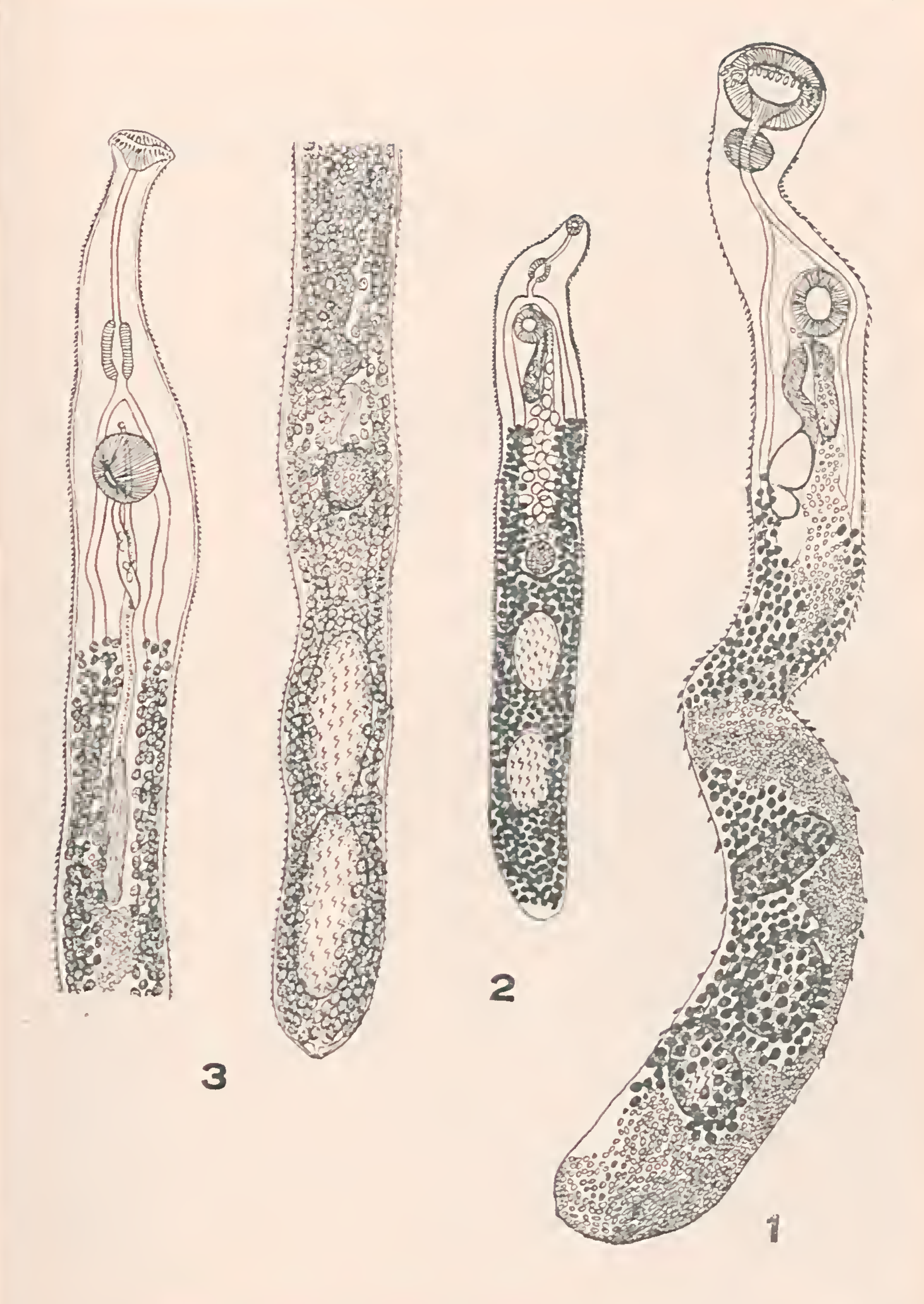
Ward: On the Genus *Deropristis* and the *Acanthocolpidae*.

Plate 3

Fig. 1 — *Dihemistephanus sturionis* Little 1930. After Little, 1930, Plate 39, figure 1. Actual length, 6.2 mm.

Fig. 2 — *Tormopsolus osculatus* Looss. Type of genus: after Looss, 1901 : 635; figure 11.

Fig. 3 — *Echinostephanus hispidus* Yamaguti 1934. Type of new genus after Yamaguti, S., 1934 : 375; figure 63.



Ward: On the Genus *Deropristis* and the *Acanthocolpidae*.

A new species of crop worm, Gongylonema phasianella, from the sharp-tailed grouse

Everett E. Wehr

Bureau of Animal Industry, United States Department of Agriculture — U. S. A.

[With 1 plate]

The nematode described in this paper was collected from the crop of the sharp-tailed grouse, *Pedioecetes phasianellus phasianellus*, and referred to the Zoological Division for identification by Prof. Myron H. Swenk, University of Nebraska, Lincoln, Nebraska. This nematode apparently represents a new species for which the name *Gongylonema phasianella* is proposed.

Gongylonema phasianella n. sp.

Description. — Cuticle annulated. Oral opening (Fig. 5) dorso-ventrally elongated, slightly depressed, and surrounded by an oral membrane consisting of 2 lateral trilobed elevations, each lobe appearing bilobed in deep focus. Cephalic papillae 14 in number, arranged in 2 groups around oral opening. Papillae of the internal circle 6 in number, very small, 1 papillae on each of the lobes of the 2 trilobed areas. Papillae of the external circle 8 in number, relatively large and nipple-shaped, dorsodorsals and ventroventrals smaller and internal to laterodorsals and lateroventrals. Amphids lateral. Cuticular bosses or shields few in number (figs. 1 and 2), irregular in size, not arranged in symmetrical rows, mostly concentrated in region surrounding cervical papillae. Cervical papillae (fig. 2) immediately anterior to lateral alae. Lateral alae visible for a distance of about 4 to 5 mm. from their beginning near cervical papillae, broadest anteriorly. Buccal cavity (fig. 6) short and narrow, lined with thick cuticle, diameter of lumen corresponding to that of mouth. Esophagus divided into an anterior narrow, muscular part and a posterior broad, glandular part.

Male (1 specimen) 10 mm. long by 168 microns wide. Cervical papillae approximately symmetrical, spine-like, about 184 microns from anterior end of body. Buccal cavity 32 microns long. Nerve ring 240 microns from anterior end of body, surrounding anterior portion of esophagus a short distance posterior to beginning of lateral alae. Anterior muscular portion of esophagus 420 microns long, posterior glandular portion 1.86 mm. long. Spicules very dissimilar and unequal; right spicule (fig. 3) approximately 150 microns long by 50 microns wide; left spicule approximately 5.85 mm. long, filiform, distal end curved. When retracted left spicule sinuous, its proximal end located 3 to 4 mm. from anterior end of body. Gubernaculum present, about 100 microns long, very weakly cuticularized. Caudal alae (fig. 3) asymmetrical, the right originating about 535 microns and the left about 625 microns from tip of tail. Genital papillae (fig 3) unequal in number, arranged asymmetrically. In the specimen examined

there were 6 preanal papillae on the left side and 5 on the right side; and there were 4 pairs of postanal papillae.

Female 22 to 25 mm. long by 210 microns wide. Cervical papillae 224 microns from anterior end of body. Buccal cavity 40 microns long. Nerve ring 340 microns from anterior end of body. Anterior portion of esophagus 511 microns long, posterior portion 3.27 mm. long. Vulva 6.75 mm. from posterior end of body in a specimen measuring 21 mm. long. Vagina S-shaped near its union with vulva, extending posteriorly and only visible for a distance of 3 to 5 mm. Eggs 50 microns long by 28 microns wide, those in vagina and terminal portions of the uteri containing coiled vermiform embryos. Tail 345 microns long.

HOST: — *Pedioecetes phasianellus phasianellus.*
LOCATION: — Crop.
LOCALITY: — Lincoln, Nebraska.
SPECIMENS: — U. S. Nat. Mus Helm. Coll. N.º 41489 (types) and 41488 (paratypes).

DISCUSSION

The number and arrangement of the cuticular bosses in *Gongylonema phasianella* are very similar to those occurring in *Gongylonema marsupialis*, a species described by Vaz & Pereira (1934), from an opossum, *Didelphys aurita*. Recently, Teixeira de Freitas & Lent (1937) secured additional specimens, including males, of *G. marsupialis* and on the basis of male characters proposed for it a new genus. *Gongylonemoides*. So far as the writer has been able to ascertain *Gongylonemoides* may be separated from *Gongylonema* by the following characters: In the former the left spicule is thick and only about twice as long as the right, and a gubernaculum is absent; in the latter the left spicule is filiform and many times longer than the right, and a gubernaculum is present. There is also some difference in the number and arrangement of the caudal papillae of the males in representatives of the two genera. As noted above, the species described in this paper resembles in number and arrangement of cuticular bosses the type of *Gongylonemoides*, but in view of the male characters it must be placed in the genus *Gongylonema*.

Gongylonema phasianella is the fourth species of the genus to be described from gallinaceous birds, and may be separated from the other species by the following key:

Key to species of *Gongylonema* in gallinaceous birds.

1. Cuticular bosses interrupted at level of excretory pore by a large transversely elongated shield; left spicule 1.7 to 1.9 cm. long — *G. ingluvicola* Ransom.

   Cuticular bosses not interrupted at level of excretory pore by a transverse shield; left spicule not over 1.2 cm. long. — 2

2. Distal end of left spicule barbed — *G. sumani* Bhalerao.
   Distal end of left spicule not barbed — 3

3. Cuticular bosses few, concentrated in region of cervical papillae *G. phasianella* n. sp.

Cuticular bosses ,many, not concentrated in region of cervical papillae *G. crami* Smit.

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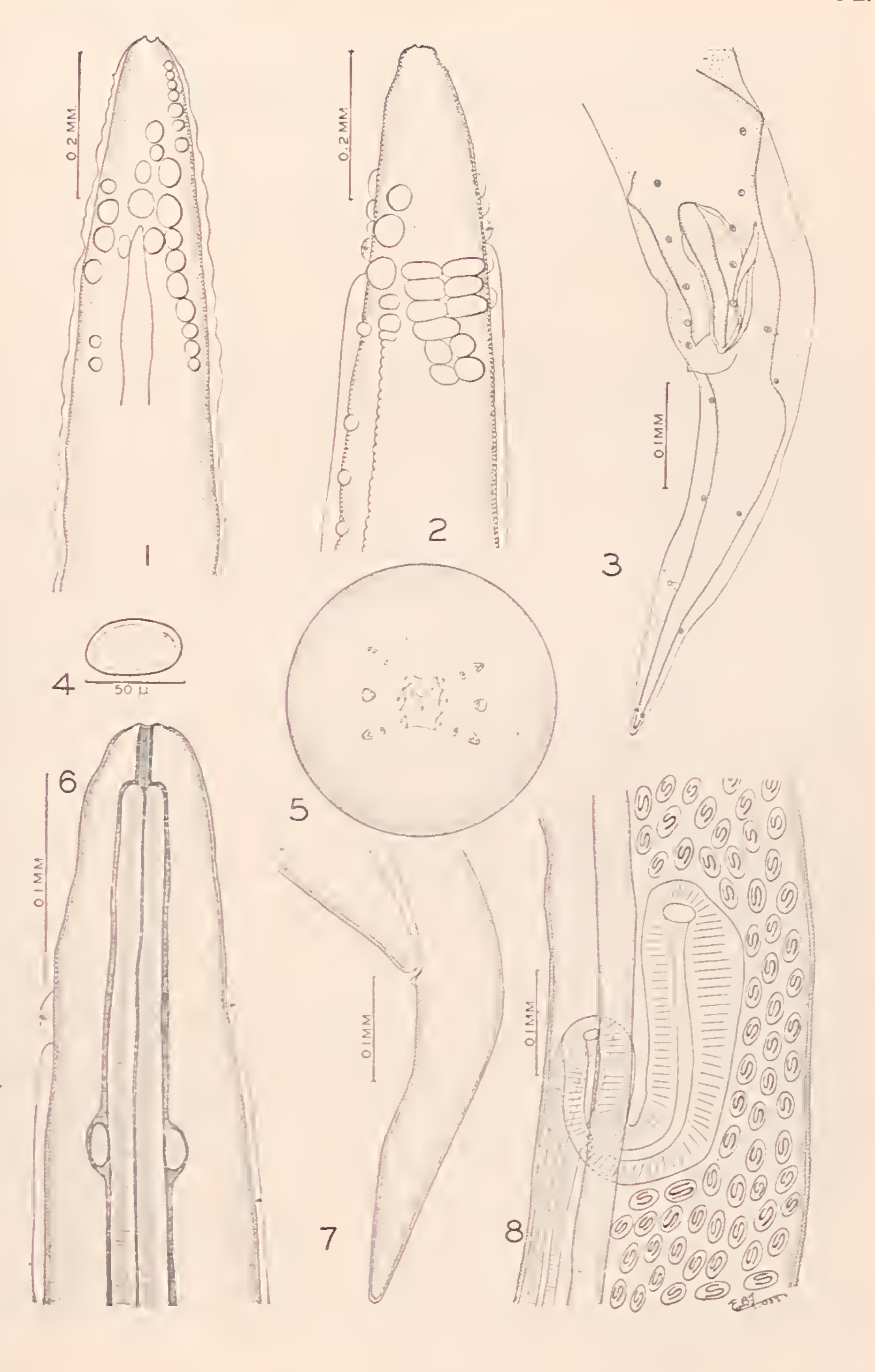
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Plate 1

Gongylonema phasianella n. sp.

1 — Anterior extremity showing arrangement of cuticular bosses, lateral view.
2 — Anterior extremity showing arrangement of cuticular bosses, dorso-ventral view.
3 — Male tail, ventral view.
4 — Egg.
5 — Head, *en face* view.
6 — Anterior extremity showing buccal cavity, dorsoventral view.
7 — Female tail, lateral view.
8 — Vulva and portion of vagina.



Wehr: A new species of crop worm.

Linognathus cervicaprae (Lucas)

(Anoplura)

Fabio Leoni Werneck
Instituto Oswaldo Cruz, Rio de Janeiro — Brasil

[Com 5 figs. no texto]

Em sessão da Société Entomologique de France, realisada em 22 de julho de 1846, M. H. Lucas descreveu e apresentou desenhos dum novo parasito colhido por M. Rouzet em *Antilope cervicaprae*, originario das Indias e em captiveiro no jardim zoologico do Muséum de Paris, communicação esta publicada nos annaes da referida sociedade, em 1847, acompanhada dos respectivos desenhos. O parasito, então incluido no genero *Haematopinus*, não mais foi encontrado pelos autores que posteriormente se dedicaram ao estudo dos anopluros, sendo conhecido unicamente atravez do estudo original de Lucas.

Piaget, em 1880, suggeriu a possibilidade de ser a especie considerada como variedade do *Haematopinus tibialis*, que nesta data descreveu de material colhido em *Antilope maori*. Esta suggestão foi adoptada nos catalogos de Dalla Torre (1908) e Ferris (1916), embora em desaccôrdo com as regras de nomenclatura usuaes, pois que o nome *cervicaprae* deveria ter prioridade. Finalmente, em 1932, Ferris a considera especie irreconhecivel, se o encontro dum parasito peculiar ao hospedador typo não permittisse redescrevel-a, como succedeu a Cummings, em 1916, com o *Linognathus pithodes* que, de modo algum, poderia ser identificado a especie de Lucas.

Ha pouco tempo, dada a gentileza de Miss Theresa Clay, tivemos opportunidade de examinar material colhido n'um *Antilope cervicaprae* do jardim zoologico de Londres e nelle encontrar parasitos com os caracteres assignalados para o *Linognathus cervicaprae*. A identificação rigorosa de nossos exemplares aos estudados por Lucas só poderia ser feita se dispusessemos do material utilisado por este autor, visto como a descripção de sua especie comporta varias outras do mesmo genero. A que aqui fazemos é baseada sobretudo na identidade dos hospedadores, que, no caso presente, perde um tanto de seu valôr porque ambos viveram em captiveiro, com possibilidade de contaminação por parasitos extranhos. Se não é possivel, entretanto, assegurar que os especimens de Lucas eram parasitos normaes do *Antilope cervicaprae*, não nos parece necessario verificar esta condição para os que examinamos. Assim, apezar de pouco rigorosa, a identificação que pretendemos estabeceler nos parece razoavel e justa, não só pela grande probabilidade de acerto apresentada como por melhor convir a nomenclatura zoologica.

Linognathus cervicaprae (Lucas).

1847 — *Haematopinus cervicaprae*, Lucas. Annales de la Société Entomologique de France, 2.ª serie, vol. 5, pags. 534, pl. 8, figs. 11 (1a-1h).

1880 — *Haematopinus tibialis* var. *cervicaprae*, Piaget, Les Pediculines, pag. 647.
1908 — *Linognathus tibialis* var. *cervicaprae*, Dalla Torre, Genera Insectorum, Anoplura, pag. 13.
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DESCRIPÇÃO:

Femea (Fig. 1). Comprimento: 1.60 mm.

Cabeça longa e estreita, tendo a porção préantennal parabolica, a post-

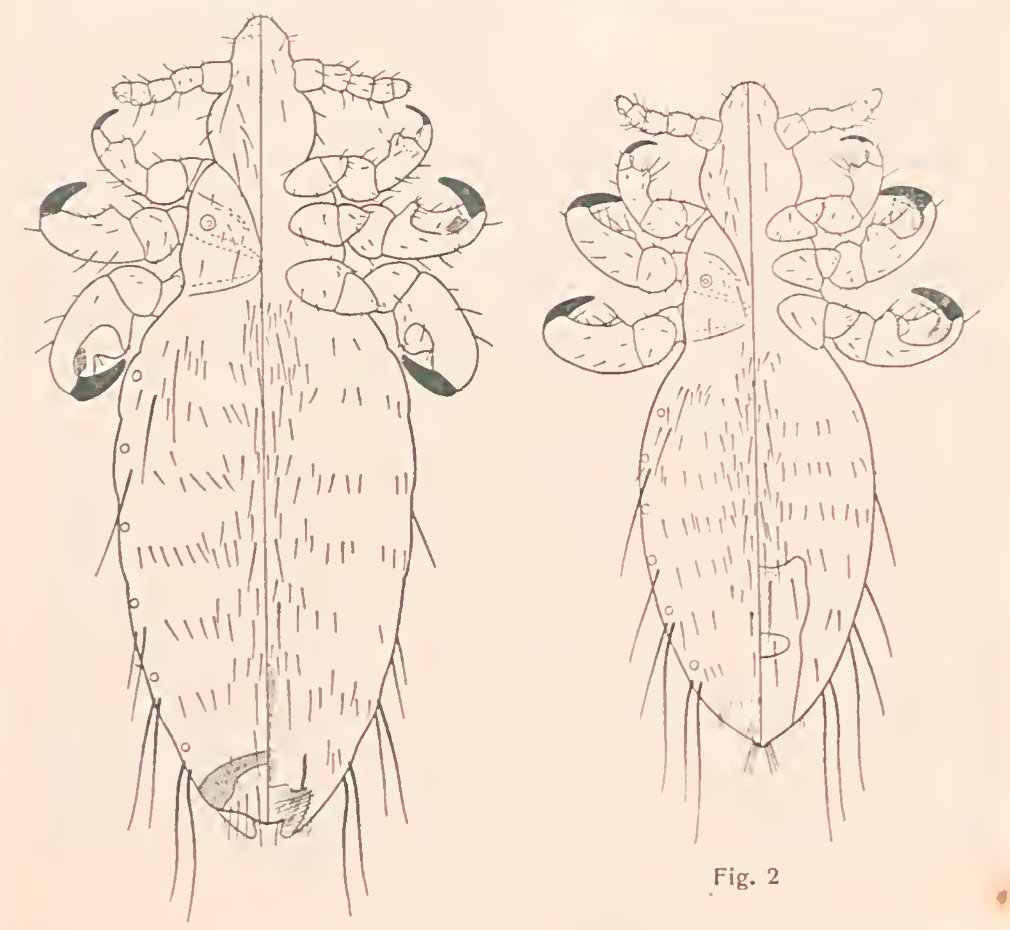


Fig. 1 — *Linognathus cervicaprae*, femea.
Fig. 2 — *Linognathus cervicaprae*, macho.

antennal dilatada e limitada por bordos lateraes convexos e a região occipital em ponta aguda que se insinua na margem anterior do thorax. O tegumento é delgado e de espessura uniforme, a não ser junto ao rostrum e ás margens temporaes onde apresenta chitinisação pouco mais intensa. Alguns pellos se encontram pela peripheria e em ambas as faces; os maiores occupam a face superior e formam duas linhas convergentes que, partindo do ponto de implantação das antennas, se reunem na região occipital.

Antennas longas e delgadas, pouco mais curtas que a porção livre da cabeça, formadas de segmentos de comprimento e diametro gradativamente decrescentes.

Thorax trapezoidal, mais largo na extremidade posterior e tendo segmentação visivel na face superior, onde ha pequeno numero de cerdas. A face inferior é inteiramente lisa e sem vestigio de placa esternal.

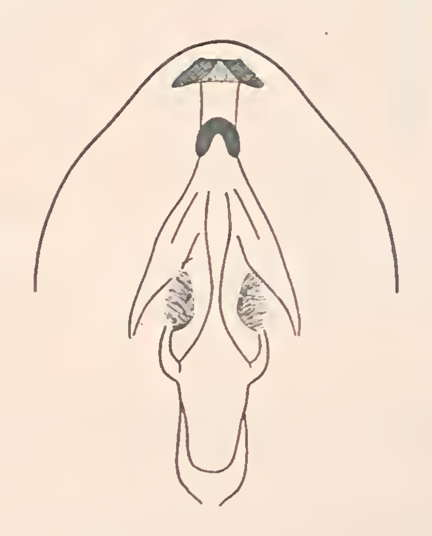


Fig. 3 — *Linognathus cervicaprae*, armadura pharyngeana.

Membros thoracicos robustos; os anteriores menores e os posteriores maiores que os medianos.

Abdomen oval alongado, tendo de comprimento quasi o dobro de sua maior largura e totalmente membranoso. Apenas, numa cinta pigmentada da extremidade posterior da face tergal e na placa genital o tegumento se apresenta ligeiramente espessado. A chaetotaxia é simples: os segmentos abdominaes typicos possuem, em ambas as faces, duas filas transversaes de cerdas; a anterior pequena e a posterior longa, estendendo-se entre as margens abdominaes, onde se implantam as grandes cerdas.

Genitalia (fig. 1), constituida por pequenas gonapophyses guarnecidas de cerdas, placa genital longa e delgada e lobulos apicaes grandes, salientes na extremidade posterior do abdomen e com numerosos pellos.

Macho (Fig. 2). Comprimento: 1.31 mm.

Differe da femea pela forma do abdomen, mais accentuadamente oval, e pela presença de grande placa genital.

Genitalia (Fig. 5) muito caracteristica da especie: Placa basal estreita e pequena, com dois longos ramos terminaes divergentes. Parameros maiores

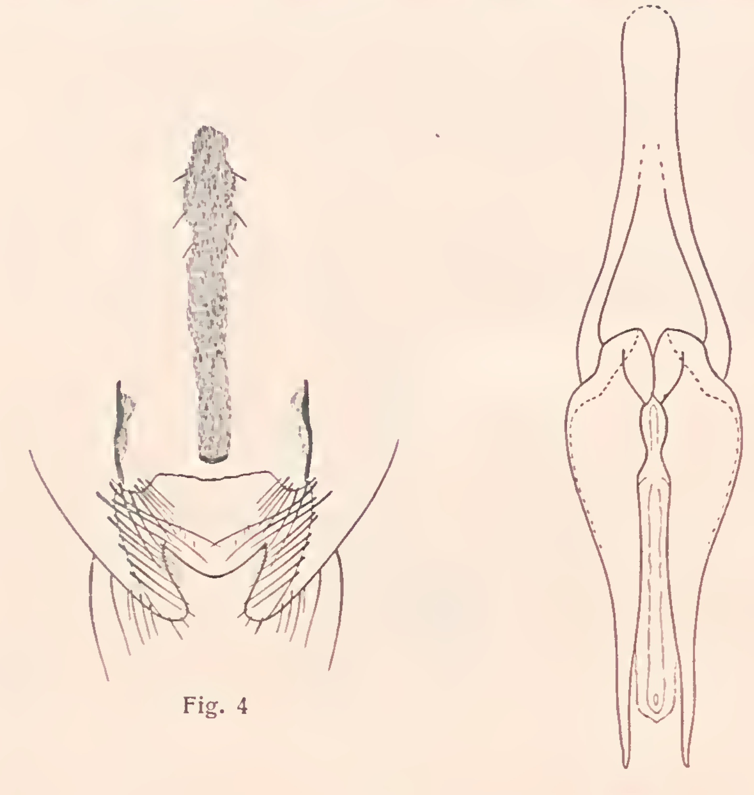


Fig. 4

Fig. 5

Fig. 4 — *Linognathus cervicaprae*, genitalia da femea.
Fig. 5 — *Linognathus cervicaprae*, genitalia do macho.

que a placa basal, fortemente dilatados na metade anterior e adelgaçados na posterior. Peça endomeral alongada e penis pequeno.



Das especies bem conhecidas, a que mais se approxima de *Linognathus cervicaprae* é, sem duvida, *Linognathus tibialis*, encontrado em varios antilopes. Mas não só desta como doutras tambem proximas (*Linognathus brevicornis*, *Linognathus fractus*, *Linognathus gnu*, *Linognathus fahrenholzi*, *Linognathus hippotragi* etc.) a especie de Lucas se distingue, muito facilmente, pelo apparelho copulador do macho e região genital da femea. Além destes, mais caracteres differenciaes se encontram na forma da cabeça, da extremidade posterior do abdomen do macho etc. Entretanto, dada a simplicidade com que a caracterisação póde ser feita com as estructuras anteriormente referidas, julgamos desnecessario citar outras de menor importancia.

Zur Biologie und systematischen Stellung des Dachslungenwurmes

Rudolf Wetzel

Institut für vet-med. Parasitologie und Zoologie der Universität Berlin

[Mit 1 Tafel]

Schlegel beschrieb 1933 aus *Meles meles* einen Lungenwurm *Strongylus falciformis*, den er 1934 *Perostrongylus falciformis* nennt. Ich hatte Gelegenheit den Entwicklungskreis des Parasiten auszuarbeiten. Die Untersuchung der dabei gewonnenen geschlechtsreifen Würmer ermöglichte mir auch ihre Stellung im System der Familie *Metastrongylidae* Leiper, 1908 nachzuprüfen.

I. Entwicklungskreis.

Die postembryonale Entwicklung des Dachslungenwurmes zeigt die bei den Nematoden üblichen 5 Stufen. Man unterscheidet 4 Larvenstadien und den geschlechtsreifen Wurm, die durch je eine Häutung voneinander getrennt werden. Die Entwicklung verläuft, wie ich in einer vorläufigen Mitteilung (Wetzel, 1937) gezeigt habe, indirekt. Sie ist an Landschnecken als Zwischenwirte gebunden.

Die freilebende erste Larve. (Abb. 1). Die ersten Larven werden von den Parasitenträgern mit der Losung ausgeschieden. Sie sind durchsichtig und haben wurmförmige Gestalt. Die Körperlänge schwankt in Wärmestarre zwischen 270-370 Mikron. Der etwa auf der Höhe der Körpermitte gelegene Breitendurchmesser beträgt 16-17 Mikron. Nach vorn verjüngt sich der Körper zu einem 4-5 Mikron breiten, stumpfen Kopfende. Der Breitendurchmesser auf der Höhe des Anus beträgt 8-9 Mikron. Das Schwanzende ist 33-40 Mikron lang und läuft in eine gerade Spitze aus. Es zeigt dorsal, etwa 7 Mikron vor der Schwanzspitze eine kleine höckerartige Auftreibung. Die Seitenlinien lassen sich mit Oelimmersion von vorn nach hinten gut verfolgen.

Die Mundöffnung ist endständig. An sie schliesst sich ein 130-150 Mikron langer Oesophagus, der fast bis zur Körpermitte reicht. Ausser der üblichen Verdickung des Hinterendes lässt er etwa 75-80 Mikron hinter dem Kopfende, dicht vor dem Nervenring, noch eine zweite leichte Anschwellung erkennen. Der 130-150 Mikron lange Darmkanal ist fein granuliert, sodass die Zellkerne und Zellgrenzen verdeckt sind. An ihn schliesst sich ein 8 Mikron langes Rektum, das mit dem Anus etwa 33-40 Mikron vor der Schwanzspitze ausmündet. Der Nervenring ist 5 Mikron breit und umschliesst den Oesophagus 85-90 Mikron hinter dem Kopfende. Fast in gleicher Höhe, 90-100 Mikron vom Kopfende entfernt, öffnet sich ventral der Exkretionsporus. Die Geschlechtsanlage ist als kleines ovales Gebilde sichtbar, das ventral vom Darm ungefähr auf der Höhe der Darmmitte liegt.

Entwicklung im Zwischenwirt: Unter natürlichen Verhältnissen dringen

die mit der Losung ausgeschiedenen Larven in den Fuss darüber hinwegkriechenden Landschnecken ein. Schon 24 Stunden später lassen sich nach künstlicher Ansteckung im Schnitt die Larven im intramuskulären Bindegewebe nachweisen, wo sie sich aufgerollt haben. Nun setzt ein lebhaftes Wachstum ein. Besonders auffallend ist das Dickenwachstum. Der Breitendurchmesser erhöht sich von 16 auf 26 Mikron. Die Larven erscheinen daher dicker. Der Eindruck wird noch dadurch verstärkt, dass in den ebenfalls verbreiterten Darmzellen zahlreiche dunkle Granula auftreten. Bald kommt es zur ersten Häutung. Sie war bei Zimmertemperatur frühestens zwischen dem 6. u. 8. Tag zu beobachten. Doch kann sie sich bei geringeren Wärmegraden bis zu 14 Tagen und mehr verzögern. Auch scheint die Art des Zwischenwirtes einen gewissen Einfluss auf die Entwicklungsgeschwindigkeit zu haben.

Die zweite Larve. Die zweiten Larven sind von der losgelösten Larvenhaut umgeben. Sie liegt dem Körper eng an, nur am Kopf- und Schwanzende ist eine kleine Kappe sichtbar. Im Bau gleichen die zweiten Larven weitgehenst dem ersten Stadium. Sie unterscheiden sich durch ihre grössere Dicke und den dunkel granulierten Darm. Auch ist die vordere Schwellung des Oesophagus undeutlich geworden. Die zweiten Larven messen 350-420 Mikron. Die grösste Breite beträgt bis zu 26 Mikron. Bei einer 406 Mikron langen Larve misst der Oesophagus 161, der dunkel granulierte Darm 204 Mikron. Die Analöffnung liegt 40 Mikron vor der Schwanzspitze. Die Geschlechtsanlage findet sich ventral von der Darmmitte.

Die zweiten Larven zeigen nur geringes Wachstum, das sich vor allem auf die Dicke auswirkt. Zwischen dem 10. u. 12. Tage kommt es dann bei Zimmertemperatur zur zweiten Häutung. Man erkennt sie an dem Auftreten einer Kopf- und Schwanzkappe zwischen der ersten Larvenhaut und dem Larvenkörper. Die entstandene dritte Larve liegt also aufgerollt in zwei Larvenhäute eingeschlossen. Die äussere erste Larvenhülle wird aber für gewöhnlich während oder nach der zweiten Häutung abgestreift. Daher findet man die dritte oder invasionsfähige Larve meist nur noch von der zweiten Larvenhaut umgeben. Auch sie ist ziemlich hinfällig und zerreisst leicht beim Herauspräparieren.

Die dritte Larve. (Abb. 2). Die dritte Larve füllt die sie umgebende zweite Larvenhaut nicht völlig aus. Sie erscheint daher kürzer und dicker als das vorhergehende Stadium. Die höckerartige Auftreibung am Schwanzende ist undeutlicher. Die endständige Mundöffnung führt in eine kurze röhrenförmige Mundhöhle. Der durchsichtige Oesophagus lässt vor dem Nervenring keine Anschwellung erkennen. Sein Hinterende ist keulenförmig verdickt. Der sich anschliessende dunkelgranulierte Darm zeigt sich in seinem Anfangsteil ser verbreitert. Die vor der Darmmitte gelegene Geschlechtsanlage ist weiter entwickelt als bei den zwei vorhergehenden Larven. Der Exkretionsporus findet sich etwa auf der Höhe des Nervenringes. Die Grössenverhältnisse sind aus den nachstehend aufgeführten Messungen von 10 dritten Larven zu ersehen.

Messungen in Mikron.

Larve Nr.	1	2	3	4	5	6	7	8	9	10
Körperlänge (ohne Hülle)	396	340	433	374	405	409	400	440	385	405
Grösste Breite	30	30	32	30	30	30	30	31	30	30
Oesophaguslänge	183	130	138	163	171	156	163	160	145	165
Darmlänge	180	180	260	176	191	207	208	200	208	200
Schwanzlänge	33	30	31	35	40	46	39	40	42	40
Kopfende-Exkretionsporus	75	76	83	75	90	90	87	90	79	80
Kopfende-G-Anlage	260	219	258	246	261	247	258	255	248	260

Entwicklung im Endwirt. Die Fütterungsversuche wurden an zwei etwa 2 Jahre alten Dachsen durchgeführt. Die Tiere waren monatelang im Gehege gehalten worden und erwiesen sich bei wiederholten Kotuntersuchungen mit der „Trichteranreicherung" frei von Lungenwürmern. Dachs „Moritz" erhielt in der Zeit vom 12-16. VI. 1936 1 *Succinea putris*, 7 *Cepaea spec.*, 2 *Fruticicola hispida* und 3 *Deroceras (Agriolimax) agreste*, die sämtlich invasionsfähige Larven beherbergten, in Hackfleisch verabreicht. Am 1. XII. 1936 fanden sich zum ersten Male Lungenwurmlarven in der Losung. Die Zahl der ausgeschiedenen Larven war bis zum 22. XII. gering, stieg aber bis 31. XII. 36 stark an. Sie fiel dann allmählich ab und erreichte am 14. I. 37 einen Tiefpunkt. Nun folgte am 16.-19. I., 8-9. II. und am 21.-22. II. 1937 abermals je ein periodischer Anstieg, der allerdings nicht die Höhe vom 31. XII. 36 erreichte. Der Dachs wurde am 22. II. 37 getötet. Die Lungen zeigten das von Schlegel (1933) beschriebene marmorierte Aussehen. Sie enthielten zahlreiche geschlechtsreife Lungenwürmer, die sich meist nur bruchstückweise aus dem Lungengewebe herauspräparieren liessen.

Dachs „Max" erhielt am 16. II. 1937 in gleicher Weise mit dritten Larven behaftete Schnecken, doch liessen sich innerhalb der nächsten Wochen keine Larven im Kot nachweisen. Es wurde deshalb am 13. III. 1937 eine zweite Fütterung vorgenommen. Am 1. IV. 37 wurden mit der Losung die ersten Larven ausgeschieden. Auch dieses Tier liess eine etwa dreiwöchentliche Periodizität bei der Larvenausscheidung erkennen. Bei der am 22. VI. 37. erfolgten Tötung wurden nur wenige Lungenwürmer gefunden.

Die Praepatentperiode betrug in beiden Fällen also 18 bezw. 19 Tage. Wegen Mangels an geeigneten Versuchstieren konnte die Entwicklung im Wirt nicht stufenweise verfolgt werden. Doch ist wohl anzunehmen, dass sie der der anderen Lungenwürmer gleicht.

Die Zwischenwirte. Aehnlich wie bei *Müllerius capillaris* (Hobmaier, 1929) und *Crenosoma vulpis* (Wetzel u. Müller, 1935) können die Larven des Dachslungenwurmes in verschiedenen Schnecken das invasionsfähige Stadium erreichen. Ich konnte sie in den folgenden Arten zur Entwicklung bringen: *Deroceras (Agriolimax) agreste*, *Arion hortensis*, *Cepaea nemoralis*, *C. hortensis*, *Fruticicola hispida*, *Euomphalia strigella*, *Succinea putris*. Es ist sicher, dass auch andere Schnecken als Zwischenwirte in Frage kommen. Praktische Bedeutung für die Verbreitung des Lungenwurmes haben aber nur die Arten, die in freier Wildbahn von den Dachsen aufgenommen werden.

II. Stellung des Dachslungenwurmes im System.

Schlegel (1933) nennt den von ihm in *Meles meles* gefundenen Lungenwurm mit Bezug auf sein sichelförmigen Spicula *Strongylus falciformis.* Später (1934) ergänzt er die Beschreibung des Parasiten und errichtet für ihn wegen der zwerghaft ausgebildeten Bursa copulatrix die neue Gattung *Perostrongylus*. Er reiht sie in die Unterfamilie *Metastrongylinae* Leiper. 1908 hinter die Gattung *Protostrongylus* Kamensky, 1905 ein. Böhm und Gebauer (1931, p. 292) stellen den Wurm wegen seiner undeutlichen Bursa in die Gattung *Filaroides* v. Beneden. Sie tun dies vermutlich auf Grund der Abbildung 3 in der ersten Arbeit von Schlegel, die die Bursa ganz undeutlich wiedergibt. Die für die systematische Stellung des Wurmes bedeutungsvolle Bursa copulatrix ist von Schlegel in beiden Arbeiten nicht genügend gekennzeichnet. Ich vermag die Beschreibung an Hand des vorliegenden Materials zu ergänzen.

Die Bursa (Abb. 3) ist zwar klein, ungefähr 22 Mikron lang, doch deutlich ausgebildet. Sie erscheint ungeteilt und ist ohne gewölbte chitinische Platten. Schlegel (1934) unterscheidet „zwei kleinste, getrennte ventrale oder Vorderrippen, zwei Paare seitliche Rippen und zwei dorsale Hinterripen". In Wirklichkeit finden sich die Rippen vollzählig in der üblichen Anordnung. Die zwei ventralen Rippen entspringen einem gemeinsamen Stamm. Ihre dicht beieinander liegenden distalen Enden sind stumpf und reichen fast bis zum Rande der Bursa. Zwischen den ventralen und lateralen Rippen ist ein deutlicher Abstand. Die lateralen Rippen liegen ebenfalls dicht beieinander. Die medio-laterale Rippe überragt die beiden anderen um eine Kleinigkeit. Die distalen Enden der Rippen sind abgerundet. Durch die schon von Schlegel (1934) beobachtete Fähigkeit die Bursa zusammenzuziehen und auszustrecken kommen die lateralen sowie die ventralen Rippen zeitweise etwas übereinander zu liegen. Die für sich entspringende externo-dorsale Rippe zeigt in der Mitte eine knollige Auftreibung, der distal ein caudal gerichteter Knopf aufsitzt. Die dorsale Rippe ist breit und teilt sich bald in zwei stumpf endende Aeste (Abb. 3 B). Spicula und Gubernaculum entsprechen den Angaben von Schlegel. Ein Telamon ist nicht vorhanden.

Nach Böhm und Gebauer (1931, p. 292) ist bei den Angehörigen der Gattung *Filaroides* v. Beneden, 1858 die „Bursa nur mehr eine Wulst". Demnach kann der Dachslungenwurm mit seiner zwar kleinen aber immerhin deutlich ausgeprägten Bursa nicht in diese Gattung gestellt werden. Ueberhaupt gehört der Wurm nach seinen Hauptmerkmalen (langer, dünner Körper, Vulva nahe dem Anus (etwa 80-90 Mikron von ihm), Bursa gut entwickelt) zur Unterfamilie *Metastrongylinae* Leiper, 1908. Doch erscheint die Aufstellung eines besonderen Genus *Perostrongylus* durch Schlegel nicht berechtigt. Das Fehlen von gewölbten chitinischen Platten in der Bursa und das Vorhandensein eines Gubernaculums ermöglichen nach dem Bestimmungsschlüssel von Böhm und Gebauer (1934). eine zwanglose Einreihung in die Gattung *Aelurostrongylus* Cameron, 1927. Es sind demnach *Strongylus falciformis* Schlegel, 1933, *Filaroides falciformis* (Schlegel, 1933), Böhm und Gebauer, 1931 und *Perostrongylus falciformis* Schlegel, 1934 Synonyma für *Aelurostrongylus falciformis* (Schlegel, 1933).

ZUSAMMENFASSUNG

1.) Die Entwicklung des Dachslungenwurmes ist an Landschnecken als Zwischenwirte gebunden. Die invasionsfähigen Stadien wurden in den Arten *Deroceras (Agriolimax) agreste*, *Arion hortensis*, *Cepaea nemoralis*, *C. hortensis*, *Fruticicola hispida*, *Euomphalia strigella*, *Succinea putris* erreicht.

2.) Es wird eine Beschreibung der ersten, zweiten und dritten Larve des Dachslungenwurmes gegeben.

3.) Bei Fütterungsversuchen an 2 Dachsen betrug die Praepatentperiode für den Lungenwurm 18 bezw. 19 Tage.

4.) *Strongylus falciformis* Schlegel, 1933. wird in die Gattung *Aelurostrongylus* Cameron, 1927, Subfam. *Metastrongylinae* Leiper, 1908 eingesetzt.

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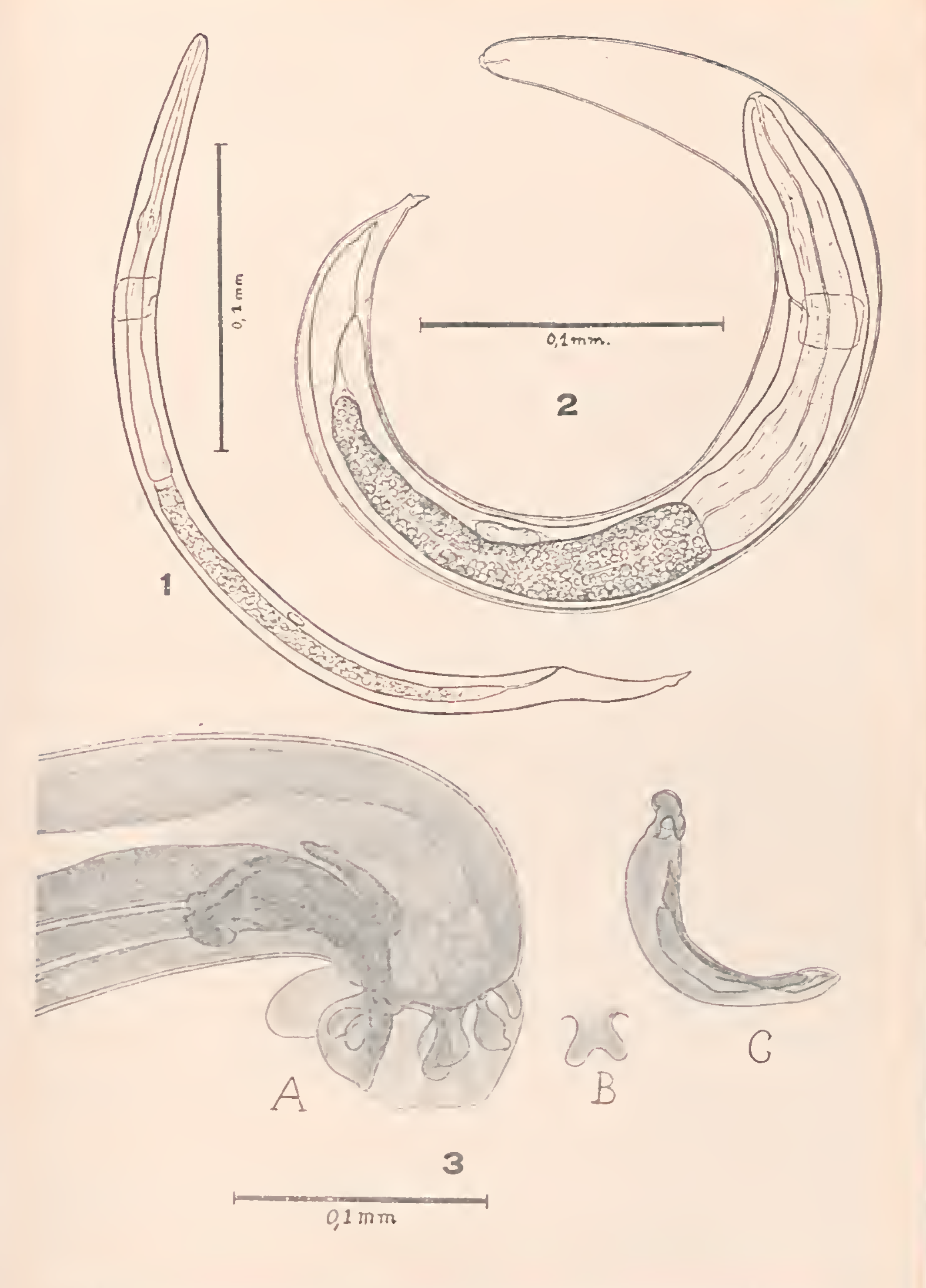
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Tafel 1

Abb. 1 — Erste Larve des Dachslungenwurmes.

Abb. 2 — Dritte oder invasionsfähige Larve des Dachslungenwurmes. Die erste Larvenhaut ist abgestreift.

Abb. 3 — Bursa copulatrix des Dachslungenwurmes.
A. — lateral Ansicht; B. — dorsale Rippe, dorsal; C. — Spiculum, lateral.



Wetzel: Zur Biologie und systematischen Stellung des Dachslungenwurmes.

Studies on Acanthocephala

3. Genus Oncicola

G. Witenberg

Department of Parasitology, Hebrew University, Jerusalem — Palestine

[With 25 text-figures]

Since the first two items of this series were published (Witenberg, 1932 a, 1932 b) a magnificent monograph of *Acanthocephala* by Meyer (1933) was issued. This work summarised all our knowledge on *Acanthocephala* and added many valuable details based on the authors own experience. Though constituting a necessary and most useful help for every investigator of *Acanthocephala*, the monograph of Meyer lacks a substantial element — differential diagnoses and keys. It contains the description of all known species, however with all their defects and deficiencies. As most of the earlier descriptions are insufficient, their value for determination of species often is very small. Most of the earlier species have to be redescribed to be recognisable. The aim of the present series is to give these redescriptions as far as the available material allows. They should serve merely to facilitate the recognition and classification of species and therefore many anatomical details which are not important for this purpose will be omitted or treated superficially.

The present article is based partly on the study of material collected by the author, but mainly of the collections lent by the following persons: Dr. W. Arndt (Zoological Museum. Berlin), Prof. U. Pierantoni (Zoological Museum of the University, Napoli) and Dr. E. W. Price (Bureau of Animal Industry, Washington, D. C.). Thanks are due to all these gentlemen for this kind and useful help.

Without going into details of the taxonomic position of the genus *Oncicola* Travassos, 1916, which will be discussed in one of the next articles of this series, it is regarded here as a member of the family *Oligacanthorhynchidae* Southwell & MacFie, 1925. Meyer (1933) ascribed following 8 species to the genus *Oncicola*: *O. bursata* Meyer, 1931. *O. campanulata* (Diesing, 1851), *O. canis* (Kaupp, 1909), *O. dimorpha* Meyer, 1931, *O. gigas* Meyer, 1931, *O. macrurae* Meyer, 1931, *O. michaelseni* Meyer, 1933 and *O. oncicola* (v. Ihering, 1902).

The present author examined all these species except *O. michaelseni* and proposes the following changes in this list:

1) *Oncicola macrurae* Meyer, 1931, shall be regarded as a synonym of *Echinopardalis macrurae* Meyer, 1931; this opinion is based on the comparison of specimens of both these species.

2) *Prosthenorchis sigmoides* Meyer, 1933, probably belongs to the genus *Oncicola* (this species has not been examined by the present author). This

supposition is based on Fig. 37 of Travassos, 1917 (or Fig. 225 of Meyer, 1933), which more ressembles in its general aspect *Oncicola* rather than any other related genus.

3) A new species, *O. travassosi*, is described in the present article.

4) *O. michaelseni* remains as a doubtful species for it cannot be identified until the dimensions of the hooks are known.

As a matter of fact, the species of the genus *Oncicola* have a very similar anatomy and their most peculiar characters are the shape of the body and the size and the shape of the proboscis hooks. Though generally the hooks of the various species of *Oncicola* are similar yet some peculiarities may be found in each species and they apparently are already fixed in young specimens.

As the outlines of the hooks cannot exactly be described drawings have been made in each instance. For this purpose a segment of the proboscis was cut by a finest ocular scalpel under a binocular microscope, placed for a day or two in glycerin and when it become transparent individual books were separated. The latter were then removed by a scalpel and needles and glycerin preparations were made for the purpose of drawing and measurement. The latter was made as outlined in the previous article (1932 a : 216-247) of this series. Permanent gelatine preparations may be made of this material afterwards, but they are not as clear as freshly made glycerine preparations. This operation seems tiresome and minute at first but after some experience it can be carried out readily and without loss of material. Care should be taken that the hooks lie strictly parallel to the surface, otherwise a distorted picture may be obtained.

As to the counting of the hooks a correction should be made to the previous article (l. c.) After many species of *Oligacanthorhynchidae* were studied by the present author, a conclusion was reached that the statement of Meyer that in this group of *Acanthocephala* the hooks are arranged in spirals is correct. Thus not longitudinal or transverse rows of hooks but the number of spirals and the number of hooks in each spiral is quoted as characterising the species of the genus *Oncicola*.

The definition of the genus *Oncicola* proposed by Travassos was slightly emended by Meyer (1933). Now, in view of new observations, the following diagnosis is proposed:

Oligacanthorhynchidae of middle size or small, spindle shaped or pyriform. Proboscis globular, standing on an almost equally wide neck both being drawn into the body without usually being inverted like the finger of a glove. On the top of the proboscis there is a big parietal sensory papilla and on each side of the neck there is a little smaller sensory organ.

Proboscis hooks are arranged in six left handed spirals each consisting of six hooks. The first four hooks of every spiral are of taenioid type, g. e. they have a spike, a root and a handle, the latter being shortest in the fourth hook. The fifth and the sixth hooks have the shape of slightly bent thorns standing on a transversely oval or rhomboidal base. The handles of the first and of the second hooks are usually symmetrical while that of the third hook has a small asymmetrical appendage directed to the left and that of the

fourth hook usually (with the exception of *O. travassosi*) has a long asymmetrical appendage directed to the right. The second hook usually is the largest [1], the first and the third ones have almost equal length which follows that of the second hook. The distance between the consecutive hooks slowly grows larger towards the posterior end of the spiral being the largest between the 5-th and the 6-th hooks. The spiral takes about half of the circumference of the proboscis.

As a peculiar generic feature there is a collar like structure between the neck and the body proper. It usually is well separated from the latter by a collar grove which has no specific muscles. The collar is smooth or it has ring-like wrinkles [2].

The lemnisci are in most species long and attenuated at their free ends.

The testes are round or slightly oval. They are situated tandem in front of the middle of the body or overlap each other and are followed by cement glands. There are four pairs of cement glands disposed in a chain which is seldom straight. Usually the cement glands form a S-like bent row or are packed together with the testes, forming a compact mass in which the individual glands can hardly be distinguished. The ejaculatory duct is large and when the male bursa is contracted it reaches almost to the middle of the body.

The eggs are slightly oval and have two shells and one very thin inner membrane. The sexual dimorphism is not conspicuous in all species and concerns mainly the shape of the posterior extremity of the body.

Parasites of land carnivores

TYPE SPECIES: *O. oncicola* (v. Ihering, 1902).

KEY TO SPECIES OF THE GENUS

1 (4)	Anterior extremity wide and truncated; adults are flattened dorso-ventrally	2
2 (3)	Collar cylindrical (in typical specimens); the first hook is 0.19-0.21 mm. long	*O. canis*
3 (2)	Collar ring-shaped; the first hook is 0.25-0.26 mm. long	*O. oncicola*
4 (1)	Anterior extremity rounded or tapering; adults are round in cross-section	5
5 (12)	Collar smooth or covered with ring-shaped wrinkles	6
6 (7)	First hook 0.16-0.17 mm. long; the handles of the hooks separated from the roots by conspicuous incision	*O. travassosi*

[1] Travassos in his monograph of 1917 quotes the size of the second hook always smaller than the size of the first one, which is a mistake.

[2] A "collar" may be observed in some species of other genera of *Oligacanthorhynchidae*, but in those cases it either disappears when the proboscis is fully extruded or it is connected with other form of the body.

7 (6)	First hook 0.20 mm. or longer; the handles of the hooks are not separated from the roots by incision	8
8 (13)	East-Asiatic species; either males or females only known	9
9 (12)	Only females known which are provided with an appendage .	10
10 (11)	Lemnisci 4/5 of the body length or longer	*O. gigas*
11 (10)	Lemnisci ca. 1/2 of the length of the body	*O. michaelseni*[3]
12 (9)	Only males known; lemnisci ca. 1/2 of the length of the body	*O. bursata*[3]
13 (8)	Brazilian species	14
14 (15)	Parasites of monkeys (insufficiently known)	*O. sigmoides*
15 (14)	Parasites of *Felidae*	16
16 (17)	Collar bell-shaped when protruded; posterior extremity of female tapering	*O. campanulata*
17 (16)	Collar ring-shaped when protruded; posterior extremity of female rounded or truncated	*O. dimorpha*

Oncicola bursata Meyer, 1931.

(Figs. 1-4)

The original material consisting of two males, borrowed from the Zoological Museum, Berlin, was examined. It was collected in the Zoological Gardens of Berlin from *Felis moormensis* brought from Malacca (Sunda). The internal structure and hooks of one of these specimens were restudied.

The worms are pyriform, slightly bent, 5.0 and 6.5 mm. long. The proboscis has an appearance usual for the genus, g. e. it is globular and bears 6 spirals of 6 hooks in each (not 5 as stated by Meyer, 1931). All the hooks are provided with barbs though the latter are not always distinct. The handle of the third hook is provided with an asymmetrical appendage directed to the left and that of the fourth one has a finger-like processus directed to the right. The following is the length of the hooks:

I — 0.21 mm.	IV — 0.14 mm.
II — 0.24 mm.	V — 0.10-0.11 mm.
III — 0.18-0.19 mm.	VI — 0.08-0.10 mm.

The collar grove may distinctly be seen only on the ventral side. The lemnisci are comparatively thick at the middle and taper at both extremities

[3] It is probable that *O. bursata* and *O. michaelseni* are identical.

of which the posterior reaches the middle of the body, g. e. to the third pair of the cement glands.

Two oval testes ca. 0.7 mm. long lie between the first and the second thirds of the body. Four pairs of oval cement glands of approximately the same size as the testes lie in a continuous row immediately behind the latter



Fig. 1 — *Oncicola bursata,* general aspect of a male.
Fig. 2 — *Oncicola bursata,* proboscis.

and go over in the ejaculatory duct. In both specimens the genital bursae were extruded. The bursa has the shape of a bell attached to the posterior extremity of the worm while the opposite side is closed by a membrane which

is supported by some 20 finger-like feelers arranged radially. Each feeler ends in a knob situated at the rim of the genital bursa.

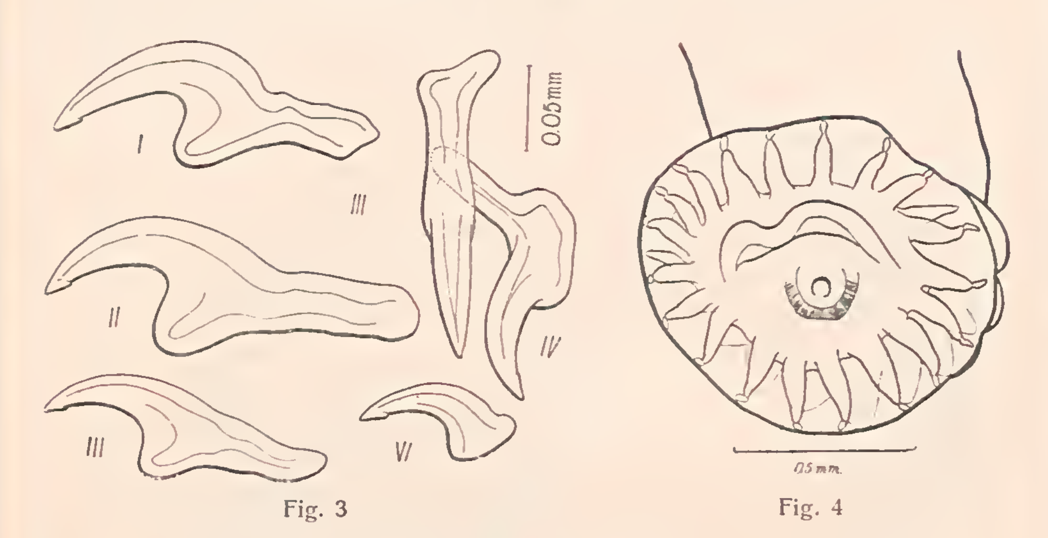


Fig. 3 Fig. 4

Fig. 3 — *Oncicola bursata*, proboscis hooks.
Fig. 4 — *Oncicola bursata*, inner side of the genital bursa.

Oncicola bursata resembles very much *O. gigas* and *O. michaelseni*, and it is possible that these species are identical. However, more material has to be examined to make this assumption conclusive.

Oncicola campanulata (Diesing, 1851) Meyer, 1931.

(Figs. 5-9)

Diesing described *Echinorhynchus campanulatus* from Brazilian *Felidae: Felis concolor, F. melivora, F. onça, F. pardalis* and *F. tigrina* and regarded it as identical with *Echinorhynchus pardalis* Westrumb, 1821, from *Felis pardalis*. Lühe (1905 : 269) agreed with the identification proposed by Diesing but laid stress on the necessity of retaining of the specific name *pardalis* as having priority over *campanutatus*. Travassos (1917), agreeing with Lühe, described under the name of *Echinopardatis* (= *Pardalis*) *pardalis* an arbitrarily chosen acanthocephalid species from Brazilian *Felidae* and applied copies of Diesing's diagram of *Echinorhynchus campanutatus* (Figs. 101-103 of Travassos) as its illustration, in addition to several new ones. Meyer (1931) pointed out that the species described by Diesing is distinct from that described by Travassos. He assigned the former to the genus *Oncicola* while the latter he quoted in his monograph (1933) as *Echinopardalis pardalis* (Westrumb).

In the opinion of the present author Meyer's conception of the species of Diesing is correct, but not as regards the species of Travassos. As a matter of fact *Echinorhynchus pardalis* Westrumb is so poorly described that even its family cannot be made out. Moreover, there are at least five related species

of *Acanthocephala* known to parasitise Brazilian *Felidae*, thus, even the host cannot help in the identification of *E. pardalis*. This species is a *species inquirenda* and no species may be identified with it until the original material

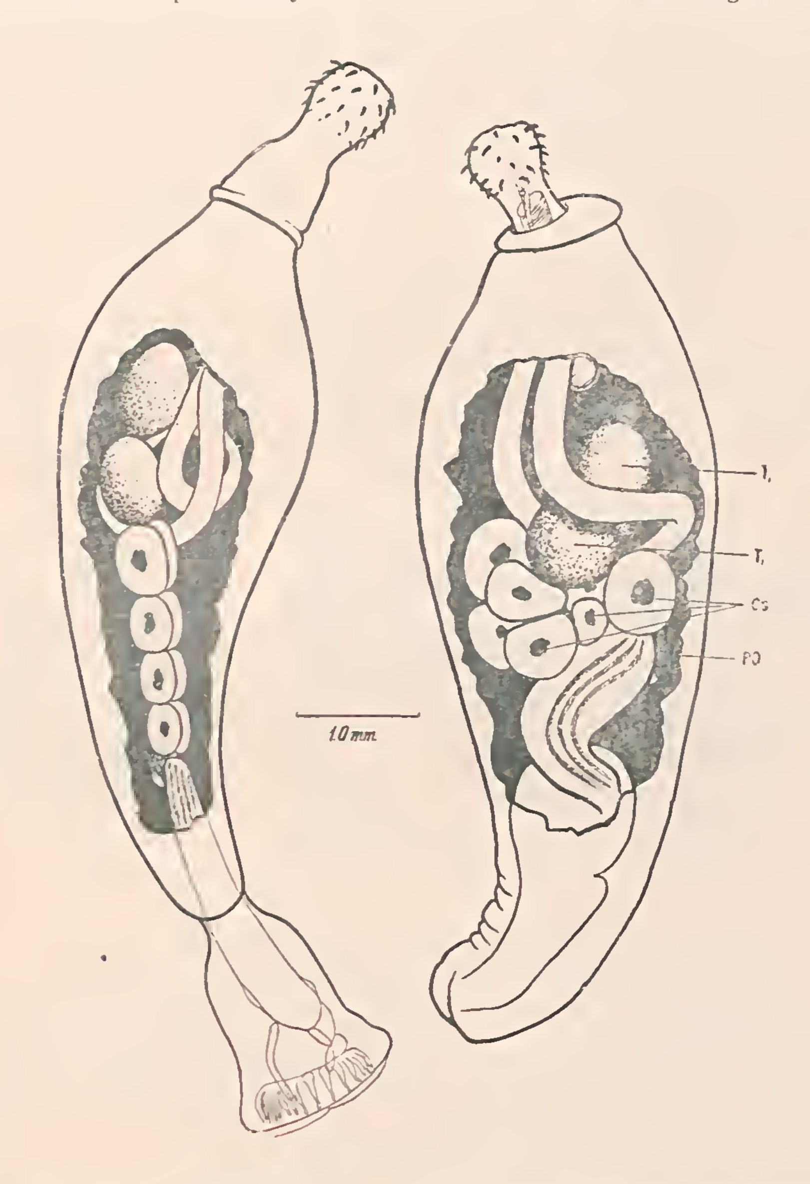


Fig. 5 — *Oncicola campanulata*, left — a male with extruded genital bursa and collar; right — a male with contracted genital bursa and collar.

is redescribed. It appears that the species described by Travassos as *Echinopardalis pardalis* is identical with a species described by Meyer (1931) as *Echinopardalis macrurae*.

For the same reason, the identification of *Oncicola campanulata* with *Echinorhynchus ovatus* Leidy (*nec* Zeder), as suggested by some investigators, should not be accepted for the latter equally is a *species inquirenda.*

The species from the African leopard described by Southwell & MacFie (1925) under the name of *Prosthenorchis pardalis* (and identified by these authors i. a. with *Oncicola campanulata*) proved to be a new species which will be redescribed elsewhere.

It should be noted that Stiles & Hassall (1920 : 378) list *F. mitis* as a host of *O. campanulala.*

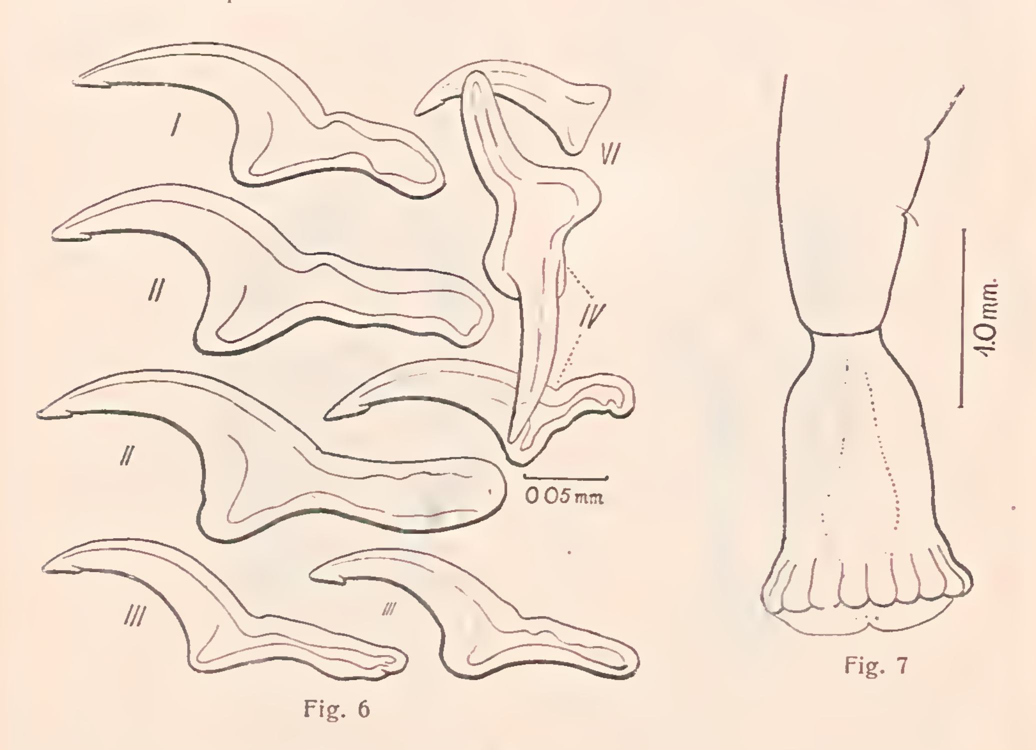


Fig. 6 — *Oncicola campanulata,* proboscis hooks.
Fig. 7 — *Oncicola campanulata,* outer aspect of the genital bursa.

The present author examined specimens of *Oncicola campanulala* borrowed from the Zoological Museum of Berlin and identified them with the characteristic diagrams of Diesing. The following are the labels of the material:

N.º 1284, *Felis jaguarundi.* Ypanema. Sept., Olf.
N.º 2567, *Felis concolor,* Brasilien, Selea, v. Olfers.
N.º 2781. *Felis concolor.*

The specimens from both three vials examined have the same shape and size and in two latter are very numerous, attached to a piece of intestine of the host. The proboscids of the worms are inserted in the intestinal

wall up to the serosa. Both sexes are equal in size and shape, 6.0-9.0 mm. long and 2.0-3.0 mm. wide, having the body proper pyriform and the posterior extremity tapering.

The proboscis is globular, 0.5-0.6 mm. wide all hooks are usually provided with a distinct barb only occasional hooks being devoid of them. The handle of the third hook has a small asymmetrical appendage directed to the left and that of the fourth hook has a finger-like appendage directed to the right. The following is the length of the hooks:

I — 0.22-0.28 mm.
II — 0.25-0.29 mm.
III — 0.19-0.20 (0.23) mm. [1]
IV — 0.16-0.17 (0.19) mm. [1]
V — 0.12-0.14 mm.
VI — 0.09-0.11 mm.

The collar is very distinct and peculiar: when protruded it has the shape of a bell set on the body proper while when retracted it has the shape of an excentric ring which is narrower ventrally than dorsally. The lemnisci usually are coiled but they would reach the posterior third of the body when stretched out. They are round in cross section and they get thinner at the ends.

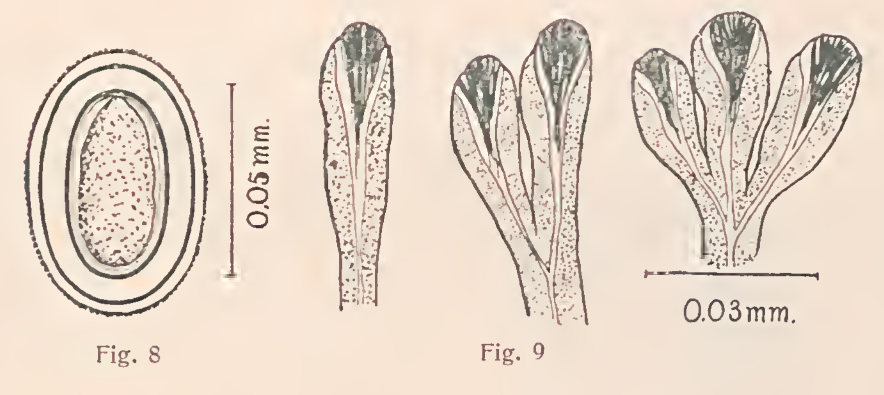


Fig. 8 Fig. 9

Fig. 8 — *Oncicola campanulata*, egg.
Fig. 9 — *Oncicola campanulata*, protonephridial colbs.

Two round and oval testes 0.8-1.2 mm. in diameter lie in the middle of the body or more anteriorly. There are four pairs of almost round cement glands often of unequal size. The relative position of the testes and the cement glands changes according to the state of contraction of the genital bursa. When the latter is contracted all the genital glands are packed together to form a compact mass in which individual glands may not always be distinguished. When it is extruded the glands lie in a continuous row. A big seminal duct is bent spirally when the genital bursa is contracted, otherwise

[1] The figures in parenthesis denote the length of the hook together with the appendage of the handle.

it is stretched out and is as long as half of the body of the worm. The genital bursa, when extruded, has a shape of a bell closed by a thin membrane on which some 24 feelers are disposed radially. In some places two or three feelers are united by a common basis. Every feeler has an elongated button-like tip.

The uterine bell has a structure similar to that of *O. dimorpha* (see below).

There is a pair of large protonephridial organs in both sexes. In males they are situated at both sides of the excretory vesicle which is attached to the anterior extremity of the seminal duct and in females they are attached to the outer rim of the uterine bell. They are similar in both sexes and their structure is identical to those of *O. dimorpha* which is described below.

The largest eggs taken from the body of a female were 0.065 × 0.045 mm. They are covered by a hard and dotted but thin outer shell in which the inner and transparent one is included. The latter contains an embryo surrounded by a thin membrane.

Oncicola canis (Kaupp, 1909).

(Figs. 10-11).

Ward (1897) was the first to record this species under the name of *Echinorhynchus* sp. from a dog. The first description was given by Kaupp (1909) of material from a dog from Texas (*Echinorhynchus canis*) and contains only generic characters. Hall & Wigdor (1918) added more details [5]. Van Cleave (1912) claims that the Armadillo (*Tatus* sp.) is the intermediary host of this species. Price (1928) found *O. canis* in a coyote (*Canis latrans texensis*) which, as suggested by Parker (1909) is probably the normal host. Price (1929) states that *O. canis* is a common parasite of dogs in Texas and its larval stage parasitise 10 % of turkeys, in the connective tissue surrounding the oesophagus.

Through the courtesy of Dr. E. W. Price the author secured three vials of this parasite from the U. S. National Museum. The specimens bear the following labels:

1) *Oncicola canis*	2) *Oncicola canis*	3) *Oncicola canis*
Canis familiaris	Canis latrans texensis	Oesophagus-turkey
Lufkin, Tex., 27335	Eagle Pass, Tex., 26313	San Angelo, Tex., 29255

The specimens from the dog were mature and apparently fully grown while those from the coyote were larvae with invaginated scolices. The present author is convinced that all these vials represent various stages of the same species because of the similarity of the hooks in size and shape.

The specimens from the dog (four specimens examined) are equally long in both sexes — 6.0-8.0 mm. The females are heart-shaped with rounded posterior extremity, the males are more elongated, tapering at the posterior

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[5] The diagrams of these authors bear an erroneous (?) name *Gigantorhynchus canis* which is not used in the text.

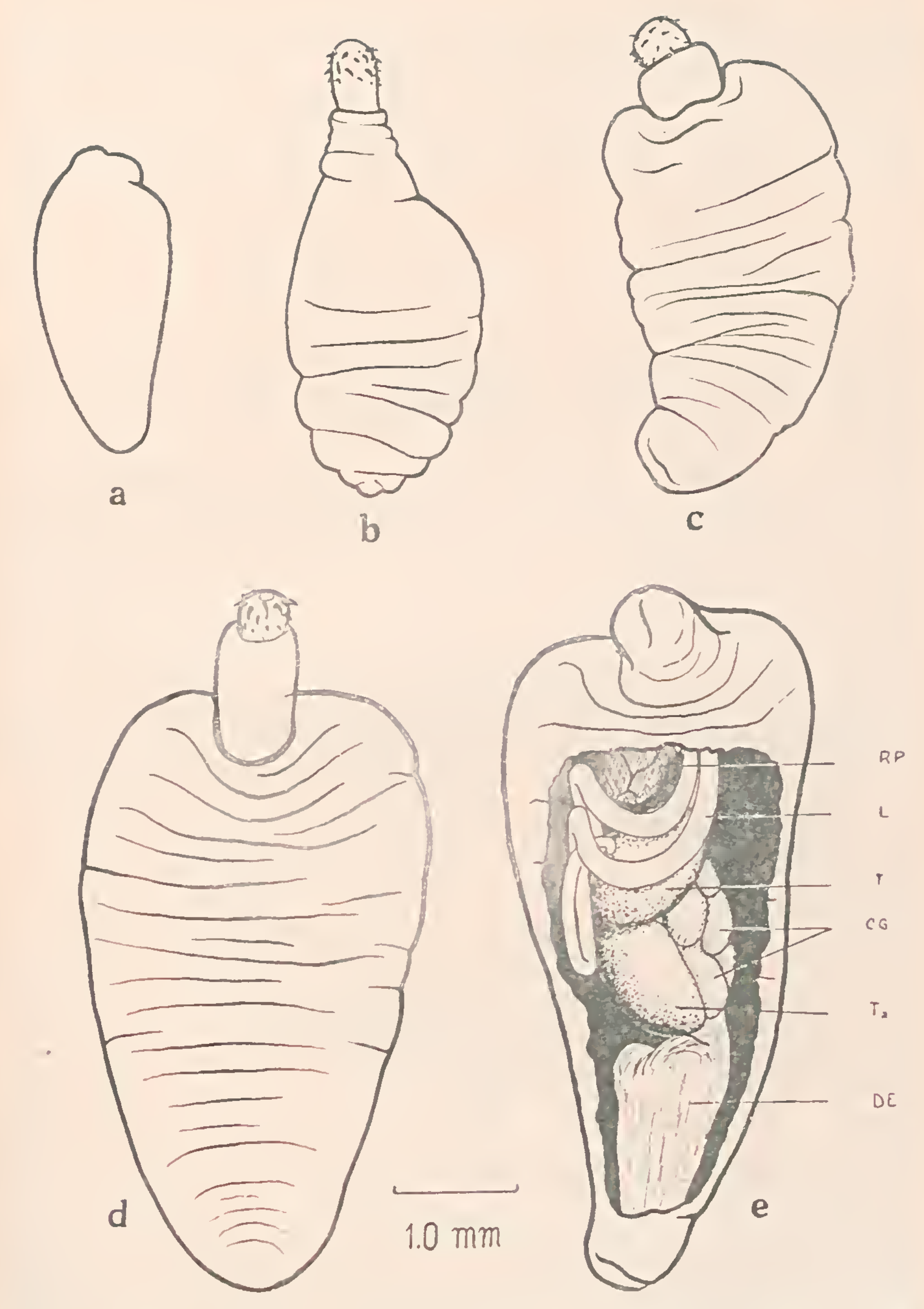


Fig. 10 — *Oncicola canis: a* — larval specimen from a turkey; *b* and *c* — young specimens from a coyote; *d* and *e* — grown up specimens with an extruded and respectively contracted proboscis.

extremity. Both males and females are flattened and covered with transverse wrinkles. The anterior extremity is very peculiar being truncated and forming « shoulders » between which an elongated cylindrical « collar » arises. This collar persists even when the proboscis is fully retracted.

The proboscis is ca. 0.5 mm. wide. The spikes of all hooks are provided with an indistinct barb. The following are the dimensions of the hooks:

I — 0.19-0.21 mm.
II — 0.21-0.23 mm.
III — 0.19-0.20 mm.
IV — 0.14-0.15 (0.18) mm.
V — 0.12 mm.
VI — 0.10 mm.

Fig. 11 — *Oncicola canis,* proboscis hooks.

The lemnisci are coiled, reaching the anterior extremity of the body when stretched out. The testes are oval, over 1.0 mm. long, and they are pressed together with four pairs of cement glands, forming a tightly moulded mass. The testes and cement glands occupy approximately the middle third of the body. Behind them lies a big ejaculatory duct and a folded genital bursa.

The specimens from the coyote were almost half as big as those from the dog and their peculiar shape, particularly the « shoulders » and the cylindrical « collar », was not as accentuated as in the latter specimens. They proved to be immature. The specimens from the turkey were ca. 2.5 mm. long, pyriform with invaginated proboscids.

O. canis has some resemblance to *O. oncicola*, but may readily be distinguished from it by the cylindrical (not ring-shaped) « collar » and smaller hooks.

Oncicola dimorpha Meyer, 1931.

(Figs. 12-17)

The original material (N.º 5083) borrowed from the Zoological Museum of Berlin was restudied. It was collected from a « leopard » (*Felis pardus* ?) in Duala (Kameroons). The material was aboundant and several specimens were examined.

As pointed out by the name, the species is characterised by distinct sexual dimorphism — the male has the posterior extremity tapering and provided with a dorso-ventral genital slit, while the female is rounded or abruptly truncated. Both males and females are round in cross section and equal in length which is 7.0-8.0 mm. The anterior extremity of the body varies in shape depending on the state of contraction. In contracted specimens the collar may be totally retracted while in stretched out specimens it appears as a narrow ring surrounding the basis of the neck.

The proboscis is globular or slightly elongated, 0.4-0.5 mm. in diameter; the neck is short. Only the first three hooks (of a spirale) and not in every specimen are provided with a barb. The asymmetrical appendages to the hooks 3-rd and 4-th are present. The following are the dimensions of the hooks:

I — 0.20 mm.	IV — 0.15-0.16 mm.
II — 0.20-0.21 mm.	V — 0.09-0,10 mm.
III — 0.19-0.21 mm.	VI — 0.08-0.10 mm.

The lemnisci are round in cross section and are attenuated at both ends; they usually are coiled, but when stretched out they would reach the posterior end of the body.

The oval testes are 0.5-0.9 mm. long and lie tandem just before the middle of the body. In distended specimens they are separated from the proboscis sheath by a short distance while in contracted ones the anterior testis overlaps this organ. A row of four pairs of oval or round cement glands follows the testes. Usually the row is straight even in stretched out specimens, seldom it tends to be bent like an S.

The female genital complex is attached to the ventral membrane of the ligament and is usually S-like or spirally coiled. It consists of a uterine bell, a selecting chamber and a oviduct. All these structures are contractile and their shape varies in different specimens. The uterine bell has a wide opening and its wall is thick and contains two symmetrically situated nuclei. Two long strings (so-called « Plasmastreifen »)

each provided with a nucleus, emerge from the bottom of the bell to be attached to the ligament outside of the mouth of the bell. There is a cone-shaped valve (?) at the bottom of the bell. The narrower posterior part of the bell opens into the « selecting chamber » which has two lateral outpockets and a complex of 8 (?) pairs of big « selecting cells » (« Wulstkörper », « Uterusgang-

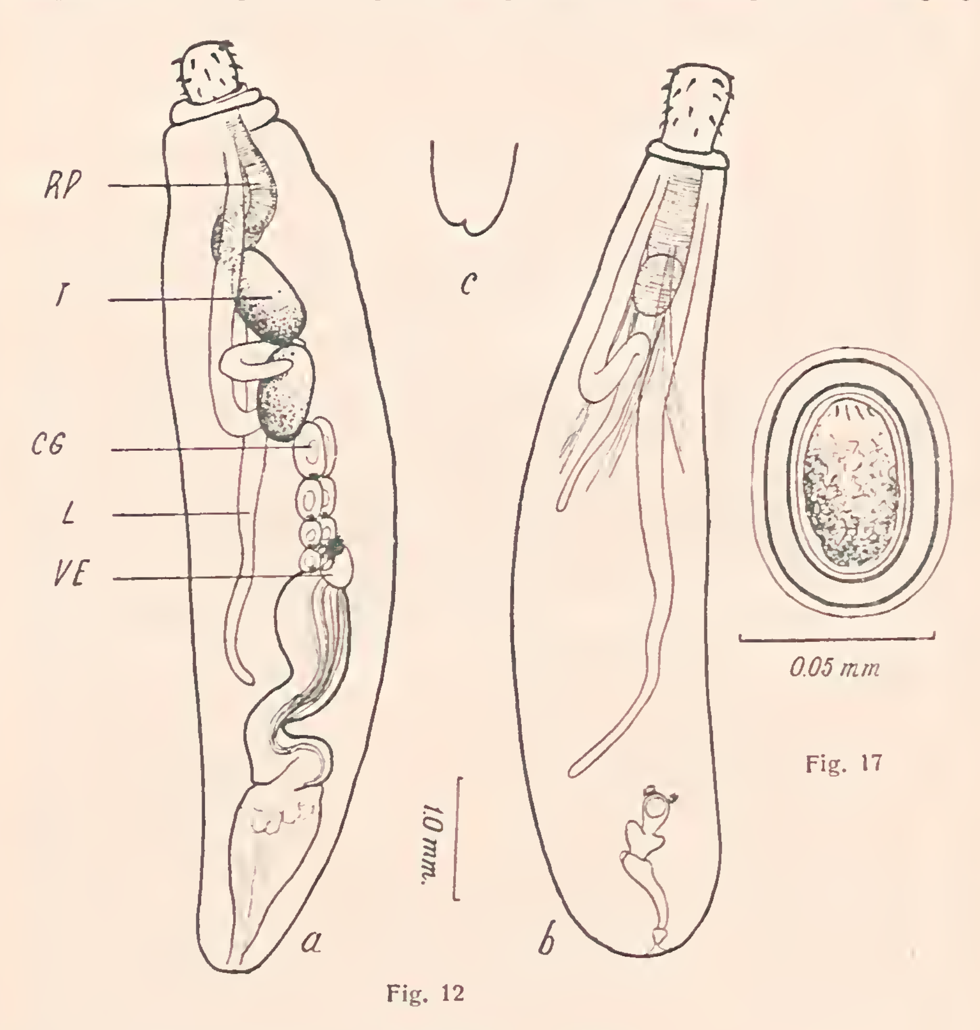


Fig. 12

Fig. 12 — *Oncicola dimorpha*, *a* — male; *b* — female.
Fig. 17 — *Oncicola dimorpha*, egg.

zellen », « Lippenzellen »). This complex of structures has probably the function of selecting the ripe eggs among those which were pushed in by the bell and to expel them in the oviduct. There are two nuclei in the ventral wall of the selecting chamber, lying symmetrically. The oviduct, separated from the selected chamber by a grove, at the dorsal side of which a big cell is situated. The

oviduct is a thick-walled muscular tube separated anteriorly from the bell by a muscular « uterine valve » and posteriorly from the vagina by a « vaginal valve ». There are two nuclei in the lateral walls of the anterior part of the oviduct and four small nucleated cells (?) just anteriorly (2) and posteriorly (2) to the vaginal valve. The vagina is short and is connected by two lateral muscular strings with the hypoderm of the worm.

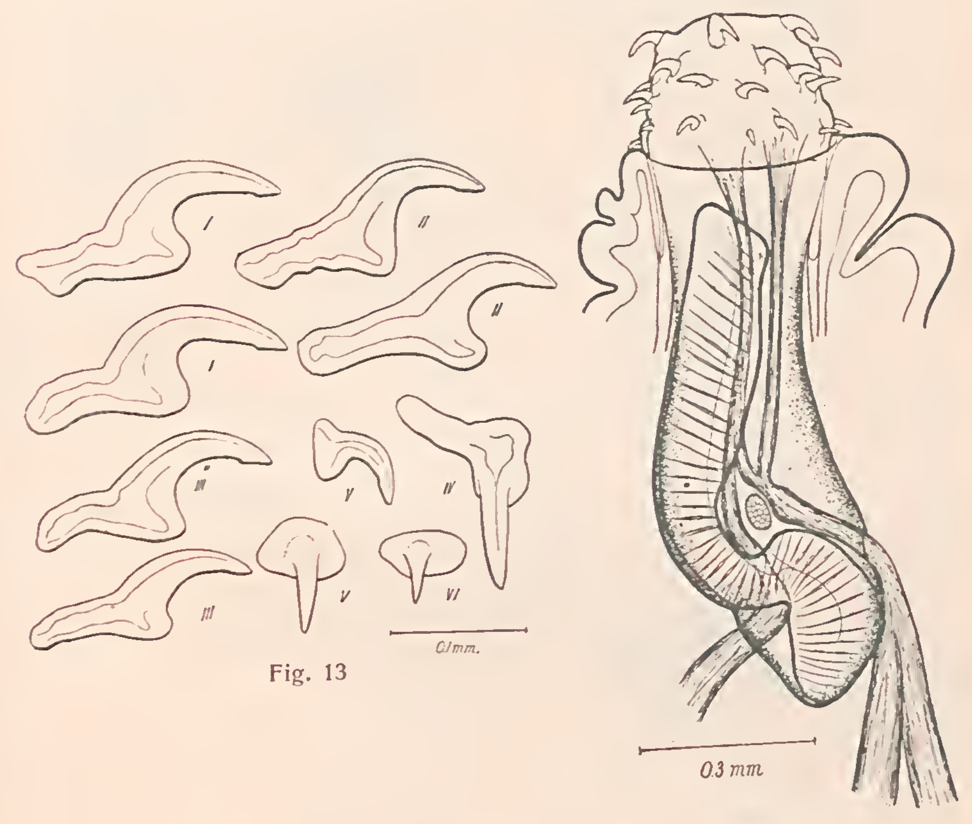


Fig. 13

Fig. 14

Fig. 13 — *Oncicola dimorpha,* proboscis hooks.
Fig. 14 — *Oncicola dimorpha,* proboscis sheath.

The largest embryonated eggs taken from the body of females were 0.065 mm. long. They have a thin outer shell, a thick and transparent inner one and a thin membrane enveloping the embryo.

The protonephridial organs are structured similarly in males and females. Each protonephridial organ consists of a flat ear-like basal body the outer surface of which is thickly beset with finger-like protonephridial colbs which are simple or branched. Three large cells each provided with a vesicle-like nucleus are imbedded in the basal body of each protonephridial organ. In females

the protonephridial organs lie dorsally to the opening of the uterine bell. In males the organs are situated on the anterior side of a big spherical excretory vesicle which is attached to the anterior end of the ejaculatory duct. The basal

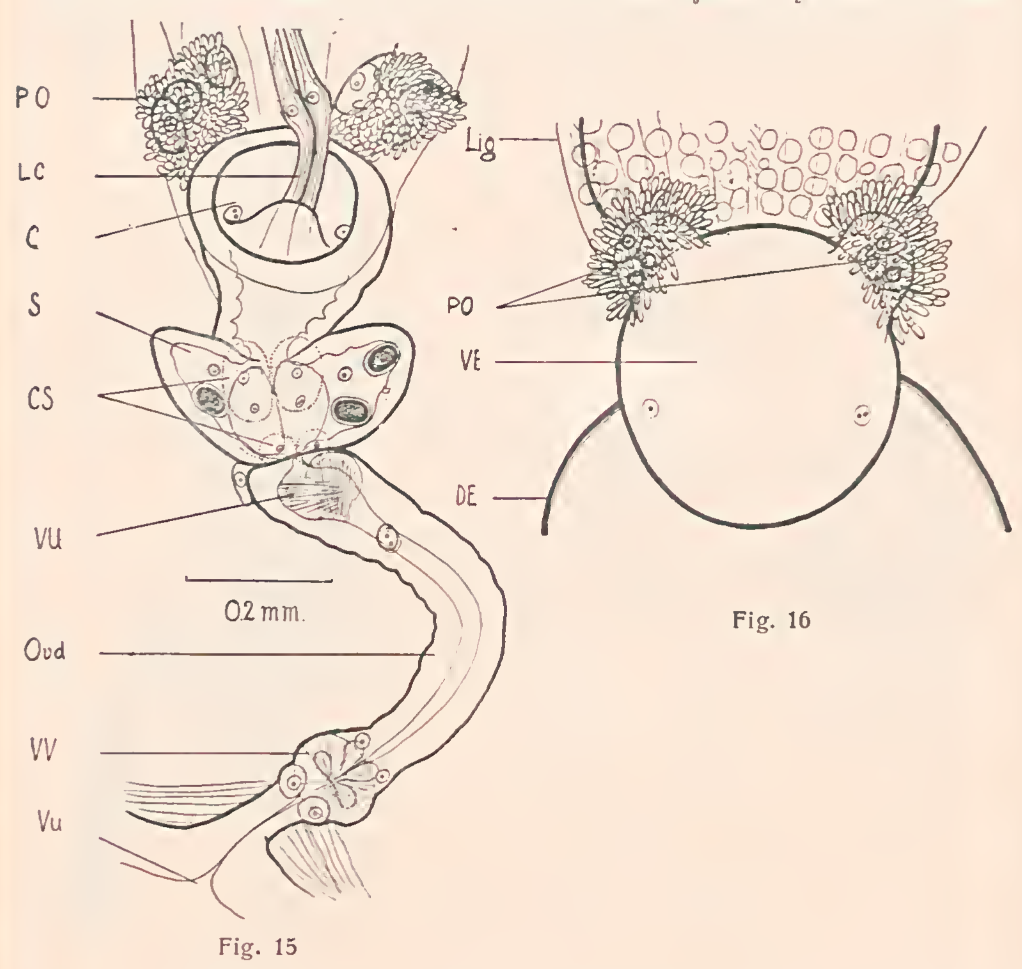


Fig. 15 — *Oncicola dimorpha*, excretory vesicle of the male with the protonephridial organs.
Fig. 16 — *Oncicola dimorpha*, female genital complex.

bodies of the protonephridial organs of the male also contain three big cells each and in addition the wall of the vesicle contains two nuclei disposed symmetrically.

Oncicola gigas Meyer, 1931.

(Figs. 18-20).

The original material borrowed from the Zoological Museum of Berlin (N.º 1087) was studied. Host (?) *Felis melas*, locality unknown. Only females are available.

The worms are pyriform 10.0-14.0 mm. long and 3-4.0 mm. wide, flattened dorso-ventrally, each having a knob-like appendage at the posterior end of the body. The collar is semiglobular, distinctly separated from the body

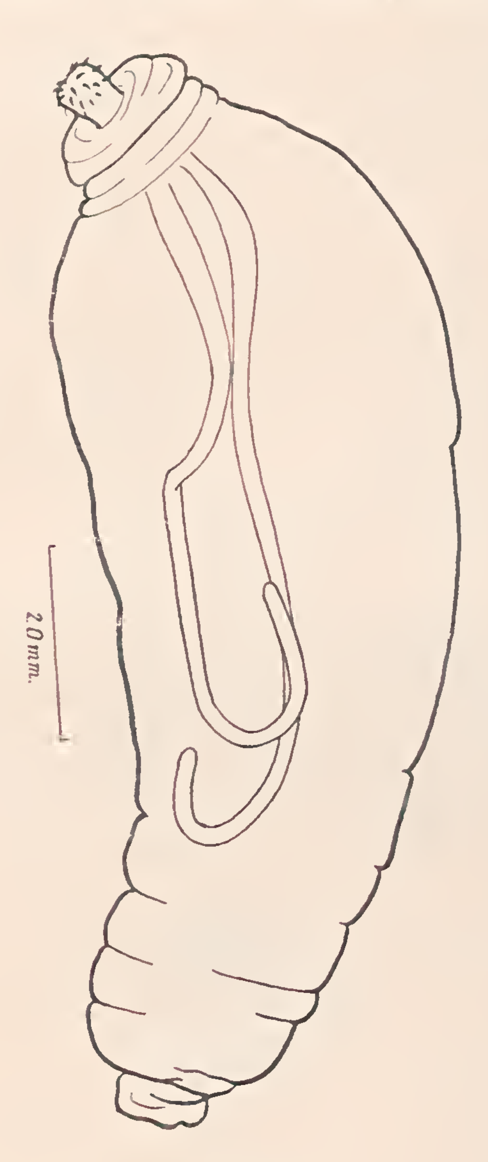


Fig. 18 — *Oncicola gigas*, aspect of a female.

by a grove; it is 1.4-1.7 mm. broad and is covered with ring-shaped wrinckles. The proboscis is globular, 0.5 mm. in diameter, is slightly bent ventrally and stands on a wide neck.

All hooks have barbs which are not always distinct. Asymmetrical appendages to the handles of the third and fourth hooks are conspicuous. The following is the length of the hooks:

I — 0.20-0.24 mm.
II — 0.21-0.26 mm.
III — 0.19-0.21 (0.23) mm.
IV — 0.14 (0.18) mm.
V — 0.10-0.11 mm.
VI — 0.09 mm.

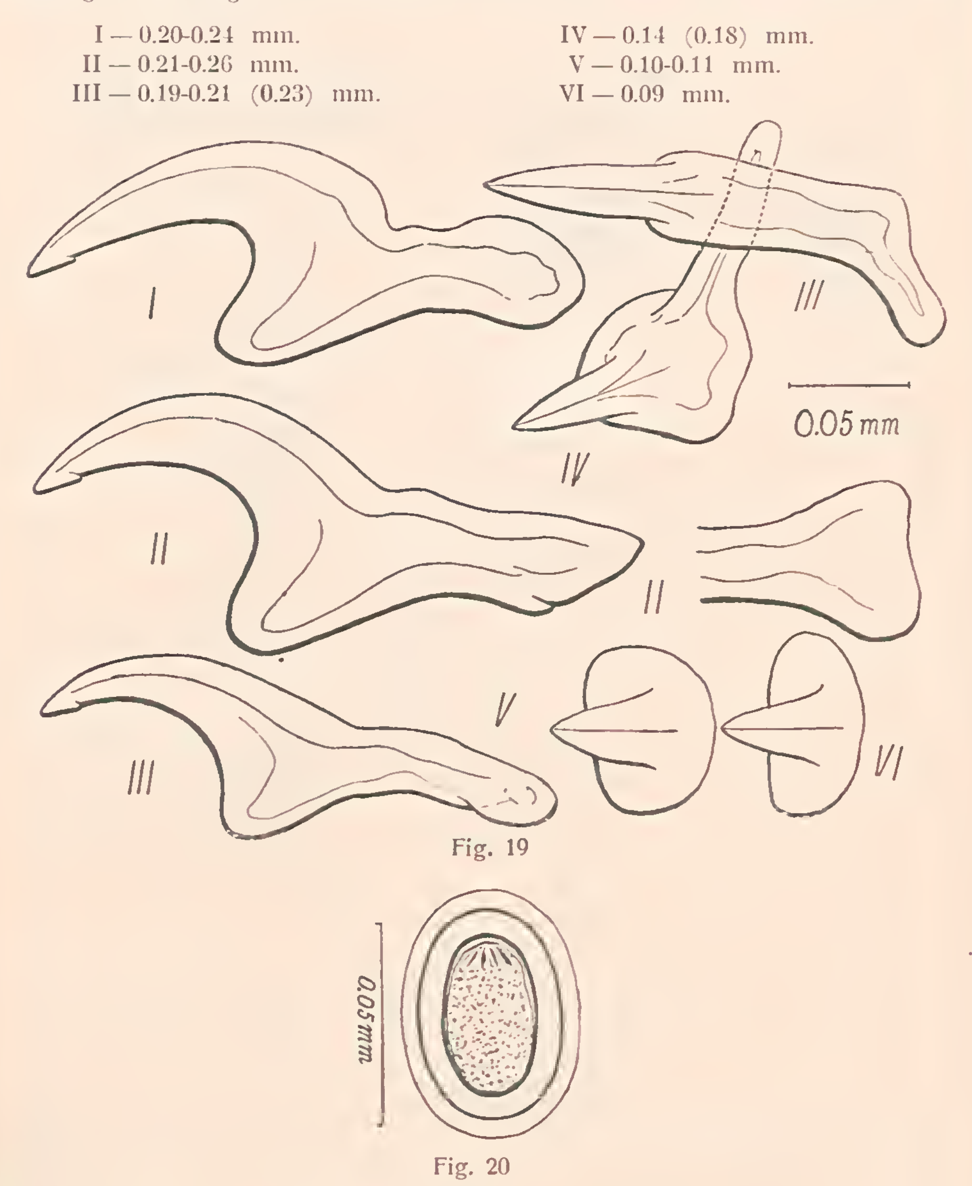


Fig. 19

Fig. 20

Fig. 19 — *Oncicola gigas,* proboscis hooks.
Fig. 20 — *Oncicola gigas,* egg.

The lemnisci are almost as long as the body and are attenuated at the ends which are coiled. The largest embryonated eggs taken from the body of one of the worms were 0.065 mm. long and 0.045 mm. wide.

The above mentioned anatomical features are not complete enough to characterise a species, g. e. they do not show enough peculiarities which would distinguish it with certainty from other species. The most peculiar character of *O. gigas* is the appendage to the female's body which however is also described in *O. michaelseni* (known from the same host). It is probable that these species are identical but at least exact dimensions of the hooks of *O. michaelseni* have to be known in order to make this assumption conclusive. There also is a marked resemblance between *O. gigas* and *O. bursata*. Unfortunately the females of the latter species are unknown and therefore conclusive comparison is impossible.

Oncicola oncicola (v. Ihering, 1902).

(Figs. 21-22).

This species was originally described as *Echinorhynchus oncicola* from *Felis onça* (in Brazil). Travassos (1916) transferred it to the genus *Oncicola* and in his paper of 1917 he quotes *Felis jaguarundi* and *Felis pardus* as further hosts emphasising that the latter record is probably erroneous (African! leopard). Travassos claims that *Tatus* sp. is the intermediate host [6].

The present author examined two vials containing this species in the Zoological Museum of Naples (N.º 138 and N.º 2719). Both consisted of few specimens of females only, collected from *Felis onça* in Brazil. They were easily determined by the description of Ihering.

The body is ca. 9.0 mm. long and has a peculiar shape in that it is flattened dorso-ventrally and that the anterior portion is wide and almost truncate while the posterior one tapers. From the middle of the truncated extremity arises a 5.0 mm. long cylindrical neck with a globular, rather wider proboscis. The neck is often bent ventrally. The basis of the neck is surrounded by a ring-shaped collar 1.0 mm. in diameter which may have circular wrinkles. The posterior extremity (of females) is rounded and provided with a small dorsal appendage which may be contracted in some specimens. The lemnisci reach almost up to the hindmost extremity of the body. They are thickened in the middle and thin at the insertion place and at the free ends.

There are six spirals of six hooks each on the rostellum. All hooks are provided with a small but distinct barb. The handle of the third hook has a small asymmetrical appendage directed to the left and that of the fourth one has a finger-like appendage directed to the right. The following are the dimensions of the hooks:

I — 0.25-0.26 mm.
II — 0.30 mm.
III — 0.24-0.25 mm.
IV — 0.18 (0.25) mm.
V — 0.14 mm.
VI — 0.11 mm.

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[6] Since the shape and dimensions of hooks of larval Acanthocephala constitute the main criterion for identification of a species, and Travassos' conclusion apparently is based on morphological comparison, the latter claim of Travassos may be accepted but with reserve. The dimensions of hooks of *O. oncicola* as quoted in the paper of Travassos are incorrect. Travassos distinguishes only four instead of six various dimensions namely: I-0.348, II-0.268, III-0.227, IV-0.120 mm.

O. oncicola has been identified by Southwell & MacFie (1925) with *O. campanulata*, *Prosthenorchis pardalis* and a species from African leopard (*Felis pardus*). We do not agree with this opinion for, all these species are quite

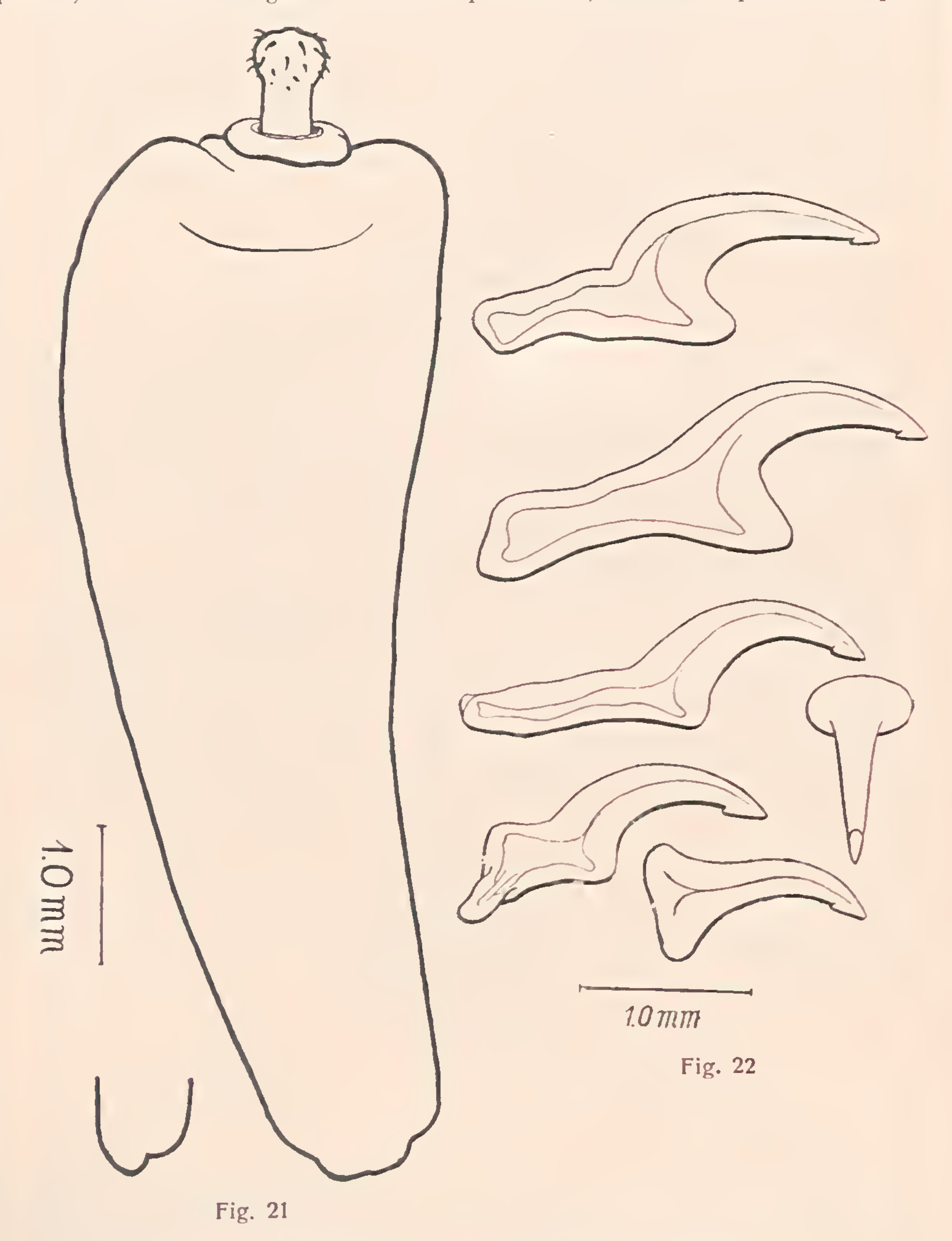


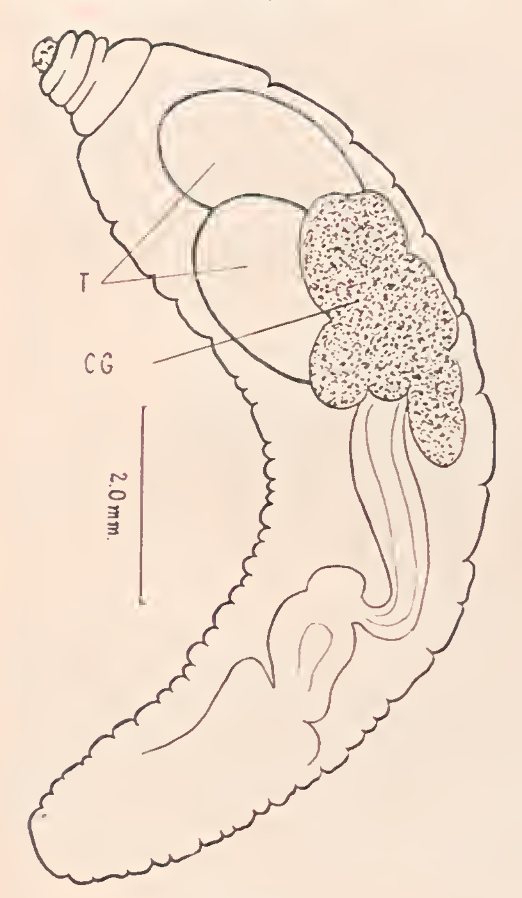
Fig. 21 — *Oncicola oncicola,* general aspect of a female.
Fig. 22 — *Oncicola oncicola,* proboscis hooks.

distinct. *O. oncicola* resembles *O. canis* in the shape of the body but differs in having the posterior appendage in females, a ring-shaped, not cylindrical, collar and larger hooks which are larger than in any known species of the genus *Oncicola.*

Oncicola travassosi sp. nov.

(Figs. 23-25).

Two specimens (one male and one female) of this species were found in *Felis bubstis* caught in the vicinity of Beersheba (Palestine).



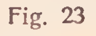


Fig. 23



Fig. 24

Fig. 23 — *Oncicola travassosi,* male.
Fig. 24 — *Oncicola travassosi,* female.

Both specimens are spindle-shaped, the female tapering more than the male. The male is 13.0 mm. long and the female is 16.0 mm. long. The anterior extremity of the body bears a subconical collar consisting of several

rings of which the most anterior is small and the consecutive ones increase in diameter.

The proboscis is globular, ca. 0.5 mm. in diameter and stands on a little narrower but longer neck. The hooks are peculiar in that the anterior root of the first three is distinctly separated from the handle by an incision which is not known in other species of *Oncicola*. The third hook has but a small asymmetrical appendage to the handle, while the fourth one has apparently (?) no asymmetrical appendage. The following are the dimensions of the hooks:

I — 0.16-0.17 mm.	IV — 0.12-0.14 mm.
II — 0.17-0.18 mm.	V — 0.08-0.09 mm.
III — 0.15-0.17 mm.	VI — 0.07 mm.

The lemnisci could be observed only in the female in which they reach the middle of the body. Their ends are not as attenuated as in other species of the genus *Oncicola*.

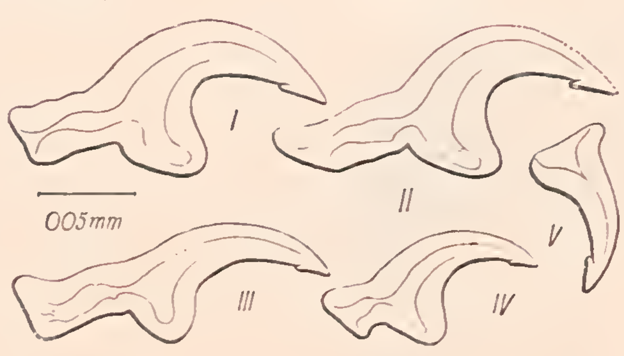


Fig. 25 — *Oncicola travassosi*, proboscis hooks.

The testes are oval, ca. 2.0 mm. long and lie obliquely to the axis of the body in the middle of its anterior half, overlapping each other. The cement glands, probably 8 in number, are pressed together behind the testes in a mass in which separate glands could not be distinguished. The ejaculatory duct and the folded copulatory bursa occupy each a fourth of the length of the body. There are no formed eggs in the female which means that both specimens are not yet mature and that their size may be larger.

Explanation of abbreviations:

C — Female genital bell; CG — Cement glands; CS — Selecting cells; DE — Ejaculatory duct; L — Lemnisci; LC — Bell strings; Lig. — Ligament. Ovd. — Oviduct; PO — Protonephridial organs; RP — Proboscis sheath; S — Selecting chamber: T_1 — Anterior testis; T_2 — Posterior testis; VE — Excretory vesicle; VU — Uterine valve; Vu — Vulva; VV — Vaginal valve.

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Distribuição geographica das especies de Diaptomus na America do Sul

Stillman Wright

Commissão Technica de Piscicultura do Nordeste – Brasil

[Com 1 estampa]

INTRODUCÇÃO

Nestes ultimos dez annos, ampliaram-se muito os nossos conhecimentos sobre as especies de *Diaptomus* na America do Sul. Desde 1925, nada menos de 34 novas especies, apparentemente validas, foram descriptas e fizeram-se algumas observações em torno das que já eram conhecidas. Apezar de muito termos aprendido nesse particular, os nossos conhecimentos ainda são lamentavelmente escassos. Este facto se torna evidente ao preparar um mappa da distribuição das especies. Poucos logares no continente foram inteiramente explorados em relação aos *Diaptomus* e areas extensas existem que nunca foram examinadas. O intuito deste trabalho é fazer um pequeno relato dos factos que dizem respeito á distribuição geographica das especies. Omittiremos aqui qualquer discussão sobre esta distribuição, tanto para especies como para grupos de especies. Tão pouco se conhece da extensão de cada especie isoladamente, que poucas conclusões de ordem geral se poderá obter pelo estudo dos dados disponiveis. E' de esperar que com successivas pesquizas, se tornará evidente uma disposição geographica mais methodica. Já é possivel formular generalisações mais amplas no que concerne a distribuição do genero na America do Sul e neste particular faremos breves considerações.

A restricção deste trabalho ao continente sulamericano não se justifica por razões puramente zoogeographicas, pois algumas especies da America Central parecem ter os seus parentes mais proximos na America do Sul. Futuramente haverá conveniencia em dividir as Americas, no que diz respeito ao *Diaptomus*, em regiões *Neotropica* e *Nearctica*.

Presentemente esta divisão não seria satisfactoria, por não dispormos de dados sufficientes e pelo facto de algumas especies *nearcticas* se extenderem na região communmente considerada *Neotropica*.

E' preciso mencionar que o autor possue algumas collecções de *Diaptomus*, cuja relação ainda não foi feita porque até agora não foram detalhadamente examinados. Estas amostras talvez contenham novas especies e certamente trarão novas informações sobre a localização das especies já conhecidas, mas é fora de duvida que os dados que dahi possam advir não invalidarão os factos apresentados aqui.

DISTRIBUIÇÃO DAS ESPECIES

Na lista que segue, as especies são dadas por ordem do appareeimento da descripção original. As considerações sobre a distribuição serão necessariamente breves, e, na maioria dos casos, o leitor que desejar informações mais

detalhadas, deverá se reportar aos trabalhos originaes. Os dados sobre localidades que forem ennumerados pela primeira vez assim como os referidos por Wright (1937 a), estão assignalados em grypho.

1. *D. gibber* Poppe, 1889. Santa Catharina, Brasil; Uruguay.
2. *D. deitersi* Poppe, 1891. Matto Grosso, Piauhy, Brasil; Paraguay.
3. *D. henseni* Dahl, 1894. Fóz do Rio Amazonas, Brasil.
4. *D. bergi* Richard, 1897. Adrogué, *Guaminí*, Argentina; Uruguay.
5. *D. michaelseni* Mrázek, 1901. Buenos Aires, Argentina; Rio Uruguay.
6. *D. furcatus* Sars, 1901. Estados de São Paulo e Rio de Janeiro, Brasil; Delta do Rio Paraná, Argentina.
7. *D. conifer* Sars, 1901. São Paulo, Brasil; Venezuela; Paraguay.
8. *D. coronatus* Sars, 1901. Estados de São Paulo e Pará, Brasil.
9. *D. falcifer* Daday, 1905. Paraguay.
10. *D. anisitsi* Daday, 1905. Paraguay; Rio Uruguay; *Buenos Aires, Argentina.*
11. *D. gracilipes* Van Douwe, 1911. Itapura, São Paulo, Brasil.
12. *D. aculeatus* Van Douwe, 1911. Itapura, São Paulo; Delta Rio Paraná, Argentina.
13. *D. marshi* Juday, 1913. Columbia; Panamá; Guatemala; Honduras.
14. *D. incompositus* Brian, 1926. Argentina; Uruguay.
15. *D. spiniger* Brian, 1926. Rio Uruguay, Rio de la Plata.
16. *D. perelegans* Wright, 1927. Calama, Amazonas, Brasil.
17. *D. merrillae* Wright, 1927. Calama, Amazonas, Brasil.
18. *D. pearsei* Wright, 1927. Calama, Amazonas, Brasil.
19. *D. santaremensis* Wright, 1927. Santarem e *Ilha de Marajó*, Pará, Brasil.
20. *D. insolitus* Wright, 1927. Calama, Amazonas, Brasil.
21. *D. calamensis* Wright, 1927. Calama e Santarem, Brasil.
22. *D. flexipes* Wright, 1927. Santarem, Pará, Brasil.
23. *D. coniferoides* Wright, 1927. Calama, Santarém, Brasil; Paraguay; *Delta do Rio Paraná, Argentina.*
24. *D. silvaticus* Wright, 1927. Pará, Brasil; Trinidad.
25. *D. infrequens* Wright, 1927. Pará, Brasil.
26. *D. denticulatus* Pesta, 1927. Delta do Rio Paraná, Buenos Aires, Argentina.
27. *D. lobifer* Pesta, 1927. Delta do Rio Paraná, Argentina.
28. *D. toldti* Pesta, 1927. Delta do Rio Paraná, Argentina.
29. *D. transitans* Kiefer, 1929. Paraguay; *Córdoba, Argentina.*
30. *D. thomseni* Brehm, 1933. Barra Santa Lucia, Uruguay.
31. *D. granulosus* Brehm, 1933. Barra Santa Lucia, Uruguay.
32. *D. meridionalis* Kiefer, 1933. Montevideo, Uruguay.
33. *D. inflatus* Kiefer, 1933. Manaos, Amazonas, Brasil.
34. *D. carteri* Lowndes, 1934. Paraguay.
35. *D. echinatus* Lowndes, 1934. Paraguay.
36. *D. carinifera* Lowndes, 1934. Paraguay.
37. *D. diabolicus* Brehm, 1935. Valdivia, Chile.
38. *D. nordestinus* Wright, 1935. Nordeste do Brasil.
39. *D. amazonicus* (n. n.) Wright, 1935. Baixo Amazonas, Guiana Ingleza.
40. *D. iheringi* Wright, 1935. Nordeste do Brasil.
41. *D. azevedoi* Wright, 1935. Parahyba, *Ceará*, Brasil.
42. *D. dahli* Wright, 1936. Ilha de Marajó, Pará, Brasil.

43. *D. cearensis* Wright, 1936. Nordeste do Brasil.
44. *D. isabelae* Wright, 1936. Jatobá, Pernambuco, Brasil.
45. *D. jatobensis* Wright, 1936. Jatobá, Pernambuco, Brasil.
46. *D. corderoi* Wright, 1936. Lagôa Santa, Minas Geraes, Brasil.
47. *D. paulistanus* Wright, 1936. São Paulo e Minas Geraes, Brasil.

Synonymia: — E' conveniente acrescentar os nomes de algumas especies descriptas como novas, e que são identicas a especies já conhecidas. Afim de evitar uma possivel confusão daremos uma lista das que, pelo consenso geral, se encontram nessas condições.

D. columbiensis Thiébaud, 1914 = *D. marshi* Juday (*in* Marsh), 1913.
D. mucronatus Brian, 1926 = *D. michaelseni* Mrázek, 1901.
D. inflexus Brian, 1926 = *D. anisitsi* Daday, 1905.
D. paranäensis Pesta, 1927 = *D. incompositus* Brian, 1926.

Além destas Kiefer (1936) suggeriu que *D. toldti* Pesta, 1927, pode ser a mesma que *D. spiniger* Brian, 1926; e Wright (1937 a) chamou a attenção para a accentuada semelhança de *D. lobifer* Pesta, 1927, e *D. coniferoides* Wright, 1927. Será necessario um ulterior estudo destas formas para esclarecer a questão.

Quanto ao *D. marshi* é interessante uma ligeira explicação. A especie foi primeiramente descripta como *D. columbiensis* por Thiébaud numa separata publicada em 1912 do trabalho apontado aqui como Thiébaud, 1914. Como esta separata não constitue publicação, a prioridade cabe ao nome dado por Juday. Este autor encontrou a especie em Guatemala, chamou-a *D. marshi* e enviou uma descripção a Marsh. Pelo mesmo tempo, Marsh encontrou a referida especie em um material proveniente do Panamá e sabendo que Juday estava para publicar sua descripção, referiu-a como *D. marshi* Juday, 1913 (Marsh, 1913). Infelizmente o relatorio de Juday demorou-se e não appareceu até 1914. A especie, por consequencia, é: *Diaptomus marshi* Juday, (*in* Marsh), 1913.

DISTRIBUIÇÃO DO GENERO

E' sabido, desde longo tempo, que a America do Sul não constitue um conjuncto homogeneo no que diz respeito aos caracteres de sua flora e fauna e que está claramente dividida em duas grandes zonas. Wallace (1876) apresentou um mappa destas zonas designando-as como *subregiões brasileira* e *chilena* da *região Neotropica*. A linha de separação attinge a costa do Pacifico ao norte do Perú, dirige-se para o sul ao longo do lado oriental dos Andes e alcança a costa do Atlantico no sul do Brasil. H. von Ihering (1900) estudando a fauna da agua doce concluiu que durante grande parte da era terciaria, as duas regiões (*Archiplata* e *Archamazonia*) eram separadas pelo oceano aberto; mais tarde as duas massas territoriaes se reuniram por emersão e a area *Archiplata* foi parcialmente invadida por formas de *Archamazonia*. Quasi tudo que se conhece em relação á distribuição dos copepodos calanoides na America do Sul, é facilmente explicado e vem mesmo corroborar a theoria

de von Ihering. Si fizermos considerações mais detalhadas em torno desta questão, este artigo se extenderia demais, porém, vale a pena nos determos apenas nos factos principaes.

Boeckella é um genero de copepodos calanoides affim ao *Diaptomus*; foi encontrada na Australasia e na *subregião chilena* da America do Sul. Na Est. 1 está assignalada com linha pontilhada a conhecida expansão septentrional desse genero. A linha de pequenos traços indica a expansão meridional do *Diaptomus*[1]. Note-se que as linhas que limitam a localização de *Boeckella* e *Diaptomus*, cruzam-se na Argentina, e circumscrevem uma estreita area habitada por ambos os generos. Estes factos assim resumidos, estão inteiramente de accôrdo com a theoria *Archiplata—Archamazonica* de von Ihering. E' de suppôr que a *Archiplata* foi primitivamente habitada por *Boeckella* e a *Archamazonia* por *Diaptomus*. Devido á juncção, por emersão, das duas massas territoriaes, os rios da *Archamazonia* dirigindo-se para o sul (systema do Rio da Prata) atravessam o novo territorio, formando um largo accesso para a expansão meridional de *Diaptomus*, mas constituindo uma barreira para a migração septentrional de *Boeckella*. Alguns factos relativos á distribuição na Argentina não se explicam por esta theoria, mas não constituem nenhuma objecção seria.

E' quasi certo que as linhas no mappa não representem os verdadeiros limites dos dois generos. Parece tambem que a linha de *Boeckella* se deslocará para o norte, na sua extremidade do lado do Atlantico, quando forem obtidos dados mais precisos a respeito. No emtanto, pode-se assegurar que a sua extremidade do lado do Pacifico permanecerá quasi na mesma posição dada no mappa, pois si o genero existisse nas cabeceiras do Amazonas elle deveria apparecer tambem nas aguas mais baixas do rio. Muito provavelmente todo o alto Amazonas é habitado por *Diaptomus*, de sorte que a sua linha de demarcação se deslocará para o sul, talvez coincidindo com o limite septentrional de *Boeckella*. Tudo faz crer que a extremidade desta linha no lado do Atlantico não soffrerá grandes modificações. É obvio que uma demarcação exacta destas linhas exigiria uma grande quantidade de collecções.

Outra ordem de factos relativos aos caracteristicos da distribuição é explicada pela theoria de von Ihering: O autor recentemente assignalou (1937) que das treze especies de *Diaptomus* conhecidas na Argentina, sómente quatro, obtidas em aguas bastante afastadas do systema do Rio da Prata, devem ser consideradas como especies fixas. De accôrdo com os nossos actuaes conhecimentos, as nove restantes devem ser consideradas como itinerantes ou como residentes com durabilidade precaria nas aguas marginaes, tal como nos lagos artificiaes de Palermo, Buenos-Ayres. Além disto, destas quatro especies consideradas fixas, sómente duas foram encontradas em região limnetica de grandes massas de agua. As outras duas parecem se restringir a poços de duração intermittente, sendo portanto formas resistentes, que facilmente se prestam á distribuição passiva. Estes factos se ligam á recente invasão do genero *Diaptomus* que attingiu a Argentina, descendo pelo systema do Rio da Prata.

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[1] O *D. diabolicus* constitue uma extranha excepção assignalada para Valvivia, Chile, por Brehm (1935). É provavel que esta especie, encontrada em um jardim zoologico, foi introduzida accidentalmente com outros organismos aquaticos.

RESUMO

Este trabalho constitue uma breve apreciação da distribuição geographica das especies sulamericanas de *Diaptomus*. Apezar de muito termos aprendido neste assumpto nos ultimos dez annos, os nossos conhecimentos ainda são bastante precarios. São ennumeradas 17 especies. Na America do Sul a distribuição de *Diaptomus* limita-se quasi inteiramente á *subregião brasileira* e invadem a *subregião chilena* sómente nas visinhanças do Rio da Prata (com excepção do *D. diabolicus*). Varias questões concernentes á distribuição dos *Diaptomus* e outros copepodos calanoides, são esclarecidas pela theoria do *Archiplata* e *Archamazonia* de H. von Ihering e, por sua vez, a corroboram.

LITTERATURA

A seguinte lista de trabalhos constitue parte restricta de toda bibliographia sobre *Diaptomus* na America do Sul. Para uma informação mais completa sobre este assumpto, veja-se as bibliographias nos artigos do autor.

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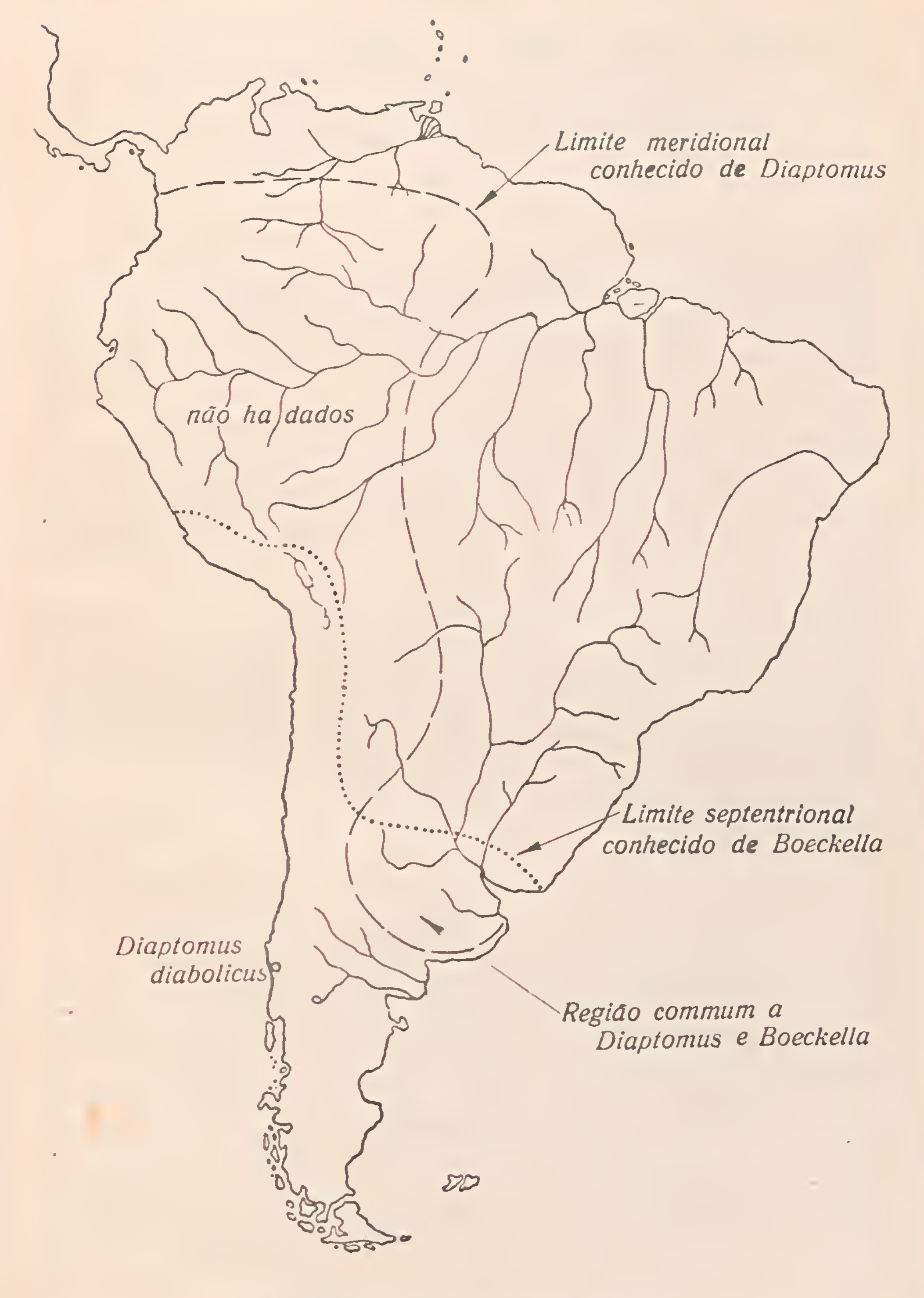
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Estampa 1

Mappa dos limites conhecidos da distribuição de *Diaptomus* e *Boeckella* na America do Sul.



Wright: *Diaptomus* na America do Sul.

Notes on Moniliformis dubius Meyer, 1933

Satyû Yamaguti and Itoku Miyata
Laboratory of Parasitology, Kyoto Imperial University, Kyoto, Japan

[With 1 plate]

In 1933 Meyer proposed a new specific name for the acanthocephalan described by Chandler as *Moniliformis* sp., because of this worm differing from the typical *M. moniliformis* (Brems.) in the size of the proboscis and eggs as well as in the number of the proboscis hooks. We agree with him in his procedure from a careful examination of the Japanese material, on which the following note is based.

Numerous specimens were obtained by the junior author of the Prefectural Hygienic Laboratory in Kobe from the small intestine of *Rattus rattus alexandrinus* (Geoffroy) (19.62 %) and *Rattus rattus rattus* (Linné) (8.57 %) caught on board the Taiwan-, Shanghai- and Dairen-liners. The number of worms found in a single host varies from 1 to 175 in *R. r. alexandrinus* and from 1 to 49 in *R. r. rattus*.

Female: — Body whitish or creamy, up to 20 cm. long by 2.0 mm. broad, divided superficially except at the two extremities into a series of over 100 bead-like pseudosegments, each of which contains at the base of the equatorial hypodermis a circular lacuna connected with the dorsal and ventral longitudinal stems. At the anterior end on the body these lacunar annuli are much closer together than elsewhere. Hypodermis very thick, containing in each median field a series of large irregularly branched nuclei extending over lacunar stems. Inner muscle sheath strongly developed. Proboscis cylindrical, truncate at distal end, 0.6 mm. long by 0.18 mm. broad in a specimen 176 mm. long, armed constantly with 12 longitudinal rows of hooks, each row comprising 10 hooks with strongly recurved blade and simple posteriorly directed root. Proboscis sheath club-shaped, 1.1 × 0.3 mm. in the same specimen, consisting of relatively thin inner longitudinal and very thick outer spiral muscles, containing a large ganglion at base.

Lemnisci attenuated anteriorly, about 4.5 × 0.2 mm., but may be much longer, each containing 5-8 giant nuclei. Neck retractor well developed. A pair of retinacula arising from posterior end of proboscis sheath. At the posterior end of the uterus is a muscular bulb about 0.18 mm. in diameter, it has two large vesicular nuclei about 24-26 micra in diameter and containing each a relatively large oval nucleolus. The vagina is divided into two portions of different structure; the anterior portion is composed of a fusiform inner and a dumb-bell-shaped outer sphincter, of which the former contains two large nuclei similar to those of the uterine sphincter and is continuous with it, while the latter has no nucleus and consists solely of fine diagonal muscle fibers, both being so closely set as to appear like a single apparatus; the posterior portion is a simple elongate muscular bulb. Eggs elliptical, provided with three distinct shells as shown in fig. 7; outer shell 108-130 × 58-63 micra, covered by a thin membrane with spiral wrinkles in full grown eggs; middle shell thick, 87-100 × 33-41 micra;

inner shell 78-87×27-33 micra; embryo 68-81×23-27 micra, with a number of hooks up to 18 micra long at its anterior end and covered over with exceedingly small spines.

Male: — Largest specimen about 80 mm. long by 1.5 mm. broad; proboscis 0.55 × 0.15 mm.; proboscis sheath 0.875 mm. long; lemnisci about 4.0 mm. long Testes elongate, at posterior portion of body; anterior 4.2 × 2.7 mm., posterior 4.4×0.87 mm., 0.25 mm. apart from each other. Säfftigen's pouch elongate, about 1.0×0.2 mm. Cement glands oval to ellipsoidal, 8 in number, crowded together immediately in front of Säfftigen's pouch; the entire mass measuring up to 2.17 mm. long. Vasa defferentia and cement ducts attenuated markedly at the point between cement glands and Säfftigen's pouch, whence the former are swollen posteriorly and unite on the dorsal side of the broadest part of the Säfftigen's pouch to form a tubular seminal vesicle, and the latter also become broader posteriorly. Bursal cap with 8 short digitiform rays.

It is worth while noting that this worm has been found exclusively in the rats (*R. r. alexandrinus* and *R. r. rattus*) captured on ships and not in those (*R. r. norwegicus* and *R. r. alexandrinus*) collected on shore, though large numbers of the latter have been examined by the junior author. This fact seems to indicate that some grain insect may act as intermediate host as suggested by Chandler.

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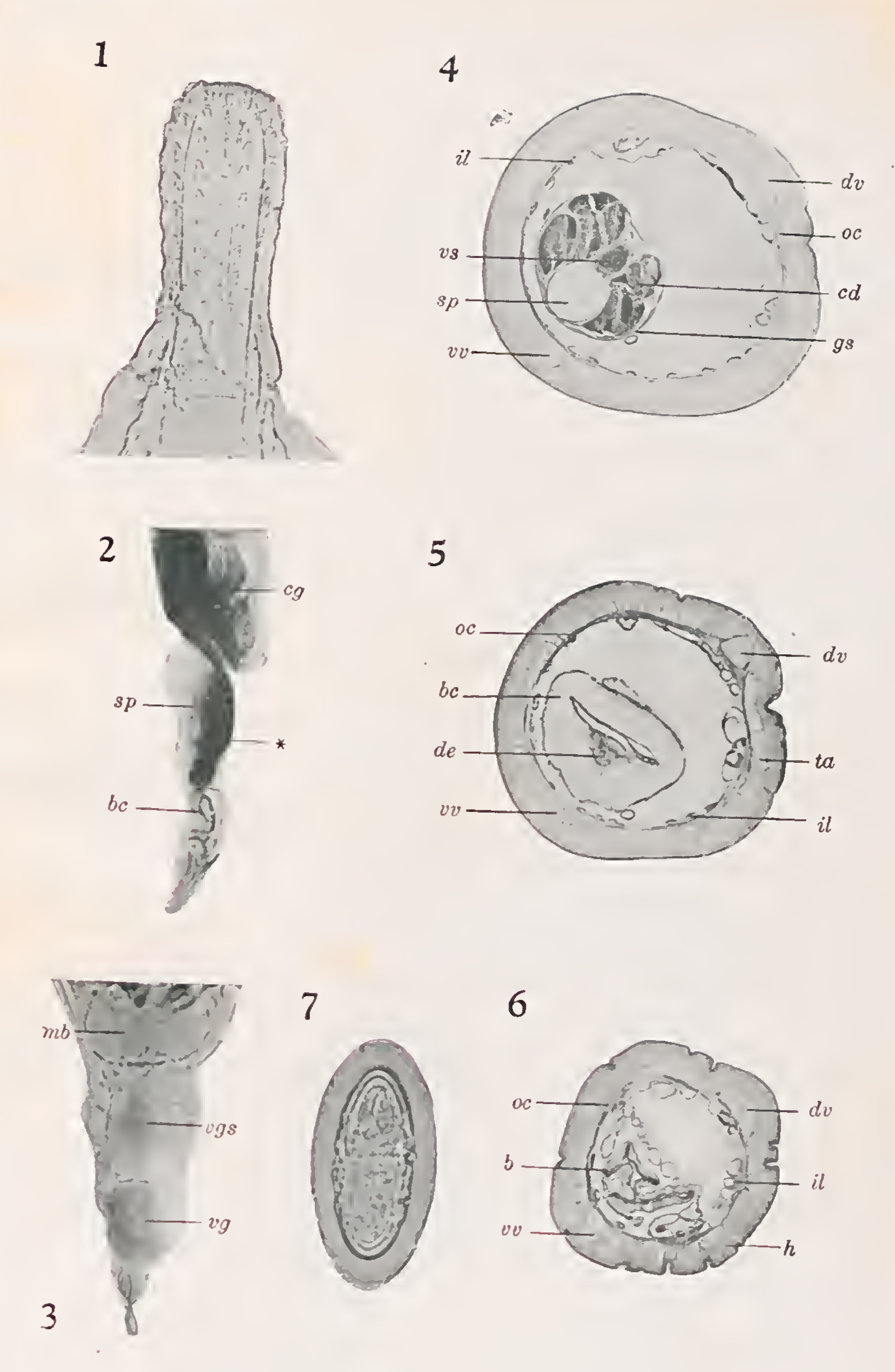
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Plate 1

Fig. 1 — *Moniliformis dubius* Meyer, 1933. Proboscis; × 75.
Fig. 2 — *Moniliformis dubius* Meyer, 1933. Posterior portion of male genital organs; × 25.
Fig. 3 — *Moniliformis dubius* Meyer, 1933. Posterior portion of female genital organs; × 100.
Fig. 4 — *Moniliformis dubius* Meyer, 1933. Transverse section through anterior part of Säfftigen's pouch; × 50.
Fig. 5 — *Moniliformis dubius* Meyer, 1933 Transverse section through bursal cap; × 50.
Fig. 6 — *Moniliformis dubius* Meyer, 1933. Transverse section through bursa copulatrix; × 50.
Fig. 7 — *Moniliformis dubius* Meyer 1933. Egg; × 300.

Abbreviations used in Figures.

b — bursa copulatrix. *bc* — bursal cap, *c* — cirrus, *cd* — cement duct, *cg* — cement gland, *de* — ductus ejaculatorius, *dv* — dorsal lacunar vessel. *gs* — genital sheath, *h* — hypodermis, *il* — inner longitudinal muscle, *mb* — muscular bulb at posterior end of uterus, *oc* — outer circular muscle *sp* — Säfftigen's pouch, *ta* — transverse anastomosis, *vg* — vagina, *vgs* — vaginal sphincter, *vs* — vesicula seminalis, *vv* — ventral lacunar vessel. ✶ — vesicula seminalis and cement ducts.



Yamaguti & Miyata: Notes on *Moniliformis dubius.*

Artificial Hatching of Ascarid Eggs

Sadao Yoshida and **Kazunaga Toyoda**
Institute for Research in Microbic Diseases, Osaka Imperial University, Japan.

[With 9 text-figs]

About twenty years ago, during his studies on the development of *Ascaris*, S. Yoshida found accidentally a very few of embryos hatched out in the medium of 0.5 % potassium permanganate in which the ascarid eggs were cultivated. Since then he was much interested in studies on the influence of chemical agents upon the development of ascarid eggs. Consequently he was induced to investigate the artificial hatching in vitro. Numerous results were obtained by his own as well as his student's Studies on these questions. The present article is the brief account of the most interesting one of them obtained by Toyoda's long years work since 1927 under Yoshida's direction.

Many prominent investigators as J. Martin. B. H. Ransom and W. D. Foster, Asada and others, confirmed through numerous animal experiments that the matured ascarid eggs human, pig, ox, or horse *Ascaris* may hatch out under the skin or in the body cavity of mammals in which they are injected. Kondo, Asada and others, japanese workers, assumed the fact that the embryonated eggs of *Ascaris* may hatch out naturally in the water culture or in the field. J. Martin and S. Yoshida proved the matured eggs of *Ascaris* may accidentally hatch in vitro of various kinds of medium.

As these experiments show, we know the ascarid eggs may easily hatch even in any part of body outside of the alimentary canal of mammalian host in which the eggs normally hatch in the favorable conditions.

At the beginning of our studies, Toyoda repeated the same experiments and confirmed the conclusion of the investigators mentioned above. Results of his experiments are tabulated as follows:

Table 1. — Result of subcutaneous hatching experiments.

Hours lapsed	*Percentage of hatched embryos and non-hatched eggs*		*N.º of experim.*
	Hatched embryos	*Non-hatched eggs*	
3	12 %	88 %	1
3	8 %	92 %	2
5	20 %	80 %	3
21	68 %	32 %	4
24	59 %	41 %	5

Table 2. — Result of hatching experiments in abdominal cavity.

Hours lapsed	*Percentage of hatched embryos and non-hatched eggs*		*N.º of experim.*
	Hatched embryos	*Non-hatched eggs*	
3	15 %	85 %	1
3	15.5 %	84.5 %	2
8	34 %	66 %	3
20	58 %	42 %	4
24	72 %	28 %	5

In these experiments, as other reported, all hatching embryos migrate to the lung or other parts of experimental animals. Toyoda devised to get the means by which the hatched embryos may be collected immediately from the hatching place before they migrate off.

According to such an intention, he tried to insert into the body cavity the ascarid eggs enclosed by various kinds of permeable membrane through which the body fluid of the experimental animal may be penetrate. He used as such a membrane, gelatinous capsule, collodium membrane, rubber membrane, animal bladder, artificial perchment, fish skin, and egg membrane. Egg membrane here used is specially devised by prof. Sera, chemist of our colleague, for his chemical work.

Results as follows: —

Table 3.

	Hatching embryos and non-hatching eggs
Gelatinous capsule	Membrane dissolves and resultless
Collodium membrane	Scarcely hatch but all eggs and embryos died in short time
Rubber membrane	Very rarely hatch but all died in short time
Bladder	Slightly hatch but died in short time
Artificial perchment	do
Fish skin	do
Egg membrane	Plentifully hatch and embryos and eggs all alive

From this experiment he assumed the ascarid eggs enclosed in egg membrane may be easily hatch in the body cavity of rabbit.

He repeated the similar experiments, inserting the enclosed eggs into the various part of body of rabbit and obtained the following results: —

Table 4. — Hatching experiments of ascarid eggs enclosed in egg-membrane in various parts of host body.

	L O C A L				
Hours	*Abdom. cavity*	*Pleural cavity*	*Subcutan.*	*Stomach*	*Intestine*
3	2 %	1 %	0	0	0
5	4 %	4 %	1 %	0	0
24	15 %	38 %	25 %	2 %	2 %
48	32 %	30 %	11 %	8.5 %	13 %
72	54 %	50 %	48 %	3 %	died

It was experimentally proved that the ascarid eggs may hatch in the favorable combination of three factors, egg membrane, body temperature and body fluid of mammalian host.

Next he intended to carry the experiments for hatching egg outside of the host animal, merely providing with three necessary factors mentioned above.

For this purpose, he conducted the experiments in using the complex apparatus holding the ascarid eggs in the mixture of the blood and Ringer-tyrode solution, instead of body fluid, held in the egg membrane, whole apparatus being hept at the temperature of 39-40° C.

The results of the experiments: —

Table 5.

	HOURS				
N.°	1	2	3	4	5
1	a few				
2		2 %			
3			4 %		
4				7 %	
5					6 %

By successive experiments he succeeded in the artificial hatching in every case of using mixture of blood and Ringer-tyrode solution or only Ringer-tyrode solution, or 0.85 % salt solution or lastly ordinal tap-water held in egg membrane capsule, being hept at the temperature of 40° C. without using any complex apparatus. From such results of experiments, he concluded that the ascarid eggs may easily hatch by 40 % in tap-water held in egg membrane capsule at the temperature of 40° C.

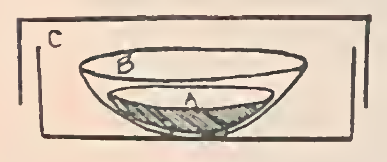


Fig. 1

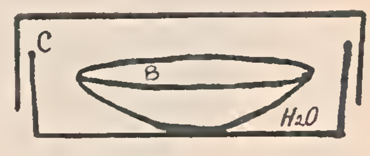


Fig. 2

A. Egg membrane capsule with water. B. Watch glass. C. Petri's dish.

According to this fact he inclined to consider if any kind of proteide, calcium or magnesium compound may be extracted from the egg membrane during incubation at high temperature of 40° C. to act as factor by which the ascarid eggs may hatch in vitro. This consideration gave him some light upon his success in the artificial hatching through the experiments by using the solution of pepton, calcium chloride, sodium chloride, and potassium chloride.

Table 6.

	MEDIUM					
% Hatching Percentage	Egg memb. & tap-water	0.5 % Pepton	0.02 % $CaCl_2$	0.85 % NaCl	0.02 % KCl	0.005 % NaH_2PO_4
	38 %	45 %	0	2 embryos	0	0

Formerly S. Yoshida proved experimentally that the ascarid eggs may hatch by a small percentage in each solution of 0.5 % of potassium permanganate, 0.2 % of chloric acid and 0.8 % of sodium bicarbonate. Here Toyoda assumed from the results of numerous experiments that the ascarid eggs may easily by high percentage in each solution of Pepton, glucose, egg-albumine, blood serum, milk, bile, pancreatic juice, several kinds of bouillon, artificial gastric or intestinal juice etc. The experimental results will be given later on.

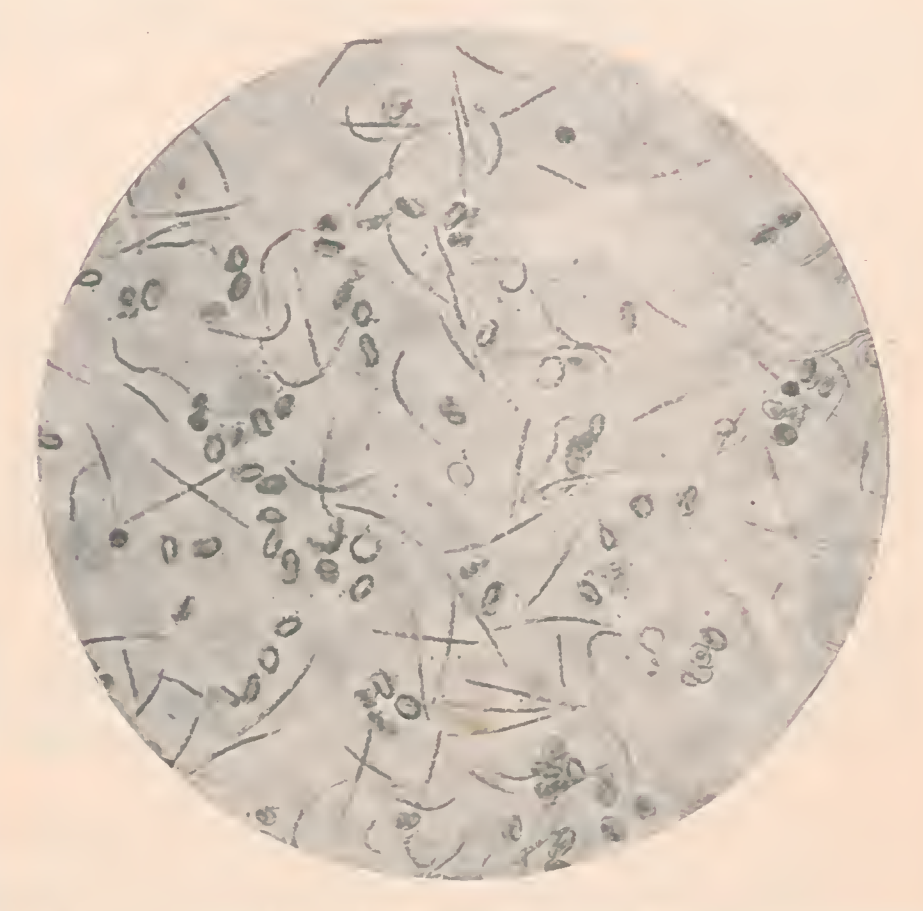


Fig. 3 — Hatching embryos of A. *lumbricoides* in 0.05 % pepton solution after 98 hours.

Figure shows the apparatus he used in his experiments. The covered petri's dish of 7.5 cm. diameter in which the watch glass with 1.5 cm. diameter stands. Petri's dish contains little amount of the disinfected tap-water to hold adequate moisture in order to prevent the sudden evaporation of culture medium About 3 cc. of culture solution of any kind is put by pipette in the watch glass and about 0.2 cc. of the fully matured eggs is carefully poured into the medium. Such a set of culture dish is put in the incubator at the temperature of 39°-40° C.

The percentage of hatching eggs varies greatly according to the concentrations of medium. In the cases of glucose and pepton solution, 0.05 % is the most favorable for hatching showing the highest percentage of 80-

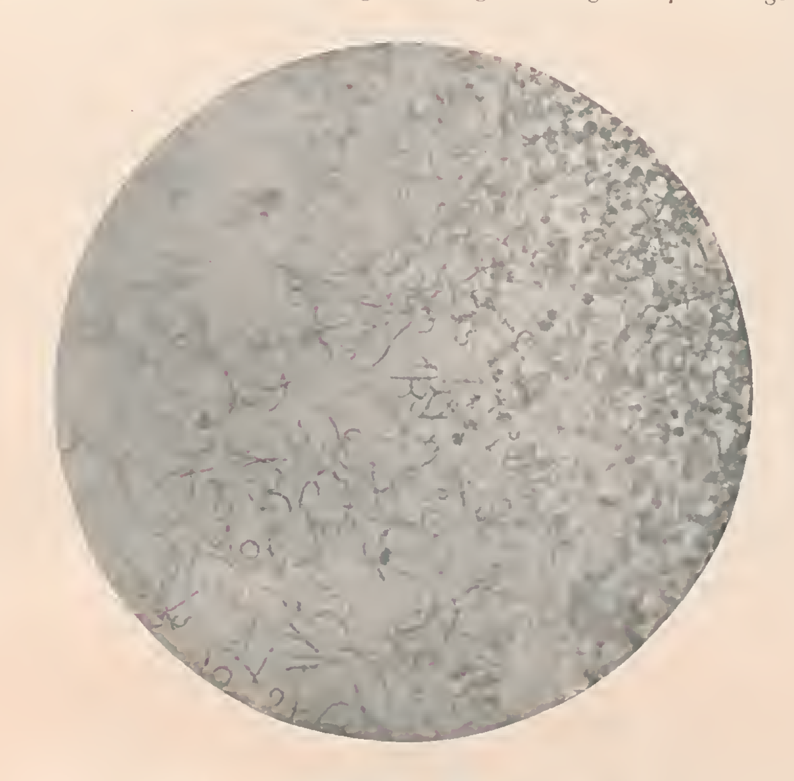


Fig. 4 — Hatching embryos of *Toxocara canis* in 0.1 % glucose solution after 4 days.

85 %. From this optimum, the percentage of hatching falls suddenly and equally towards both stronger and weeker concentrations of medium, as shown in the attached curve.

Followings are very noticeable facts. The pepton medium higher than 1 % is easily corrupted by incubation and this putrefaction may injuriously act upon the eggs so as to lesser the hatching percentage.

The embryos hatched out in the pepton medium of lower concentration are more active and more resistible than those in higher concentration. In pepton solution, the highest percentage of hatching takes place after a day or more, but it happens after 3 to 7 days in the case of glucose medium. The embryos hatched in glucose solution are generally stronger and more resistible than those in pepton medium.

Some results of the repeated experiments for the hatching of several kinds of *Ascaris* eggs in using adequate concentration of various solutions are given in the following table.

Table 7

MEDIUM	KIND OF EGG *Dog Ascaris*	*Dog Ascaris*	*Dog Ascaris*	*Human Ascaris*	*Pig Ascaris*	*Pig Ascaris*
Egg albumine (1 20)	55 %	48 %	53 %	60 %	54 %	60 %
Egg yolk (1/300)	40 %	43 %	38 %	31 %	47 %	50 %
Dog blood serum (1/10)	50 %	54 %	47 %	48 %	52 %	61 %
White sugar (0.1 %)	56 %	51 %	42 %	50 %	55 %	68 %
Human milk (1 20)	60 %	54 %	55 %	42 %	48 %	52 %
Cow's milk (1/50)	58 %	50 %	56 %	47 %	50 %	53 %
Skin milk (1/50)	60 %	52 %	54 %	42 %	44 %	48 %
Bile (1/50	38 %	36 %	32 %	28 %	46 %	40 %
Pancreatic juice (1/50)	35 %	31 %	30 %	31 %	32 %	42 %
Pepton (1/20)	35 %	42 %	37 %	23 %	34 %	37 %
Bouillon (1/20)	42 %	38 %	31 %	18 %	30 %	41 %
Maltan bouillon (1 20)						
Polytamin bouillon (1/20)	48 %	38 %	36 %	21 %	24 %	28 %
Artificial gastric juice (1/10	35 %	42 %	38 %	22 %	23 %	30 %
Artificial intestinal	1 %	0.5 %	0,6 %	1 %	0.5 %	0.5 %
juice (1/1	2 %	3 %	3 %	4 %	2 %	3 %
0.1 % Pepton	71 %	69 %	66 %	54 %	58 %	55 %
0.05 % Glucose	58 %	68 %	54 %	62 %	54 %	46 %

In this table, the optimum concentration of medium and hatching percentages at the end of 5 days incubation are given.

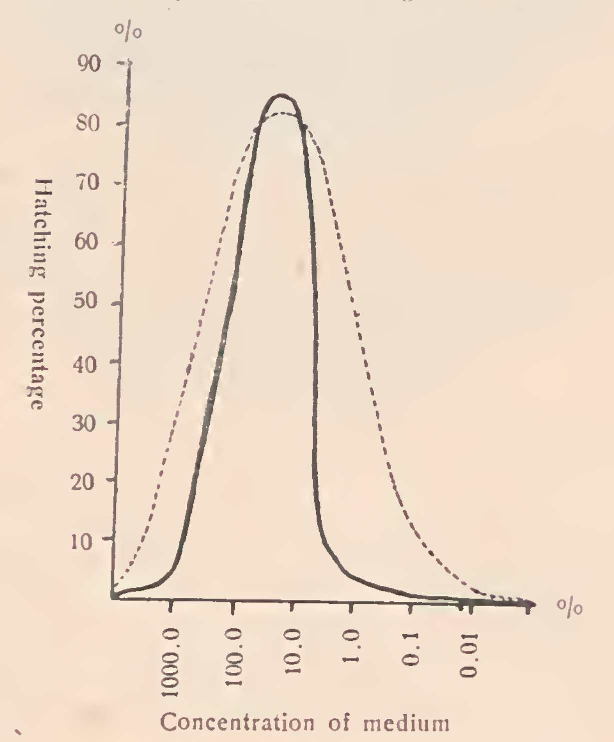


Fig. 5

In 0.05 % albuminuria and 0.1 % glycosuria, the eggs may also easily hatch.

Ascarid eggs hardly hatch in butter solution, even if it happens to hatch, it is very few and the fat seems to be injurious to development of the eggs. Vitamine A is also unfavorable for hatching, the embryos hatched in the solution nearly all died within 1-5 hours after hatching. In vitamine B, the eggs may hatch in 20 % and in vitamine D more easily hatch by 35 %.

Influences of various conditions of eggs upon the percentage of artificial hatching. As the development of ascarid eggs is greatly influenced by various conditions of the eggs themselves, the hatching percentage also similarly depends upon the conditions of the eggs.

It is very difficult to get a good result of artificial hatching of ascarid eggs, because there are many factors which may act delicately upon the process of hatching.

Of course all procedures must be made most carefully in making a medium, in handling of an apparatus, or in disinfecting all things which are to be used in the experiment. Even a slight lack of any precaution will make a cause of failure in experiment.

The uterine eggs and the eggs in faeces are both better in a fresh condition than the older for artificial hatching. Moreover the fully developed eggs in uterus are more favorable than those in faeces. Fully matured eggs must be selected for good result of hatching, about 14-25 days old eggs (3 weeks old in general) in cultivation at the optimum temperature are, therefore, the most favorable for this purpose.

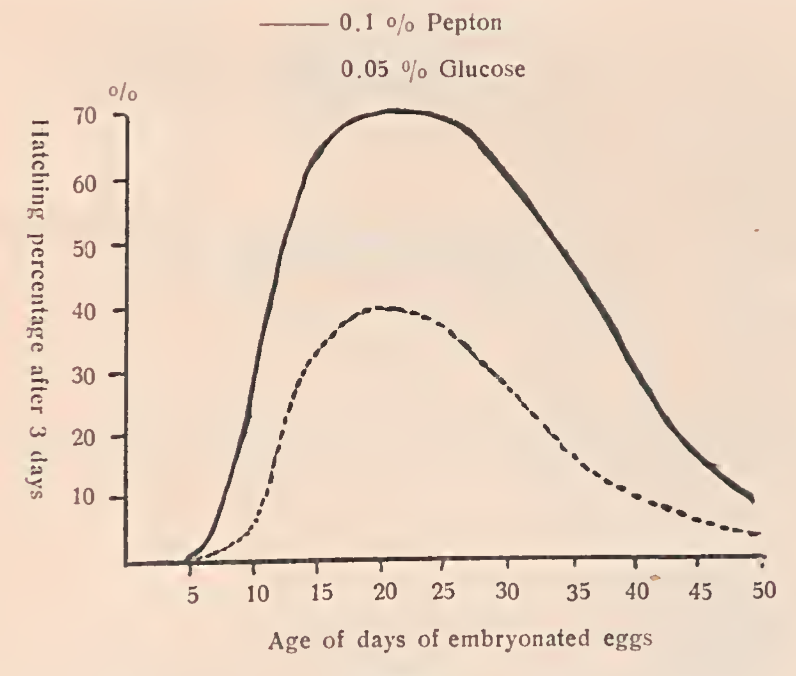


Fig. 6

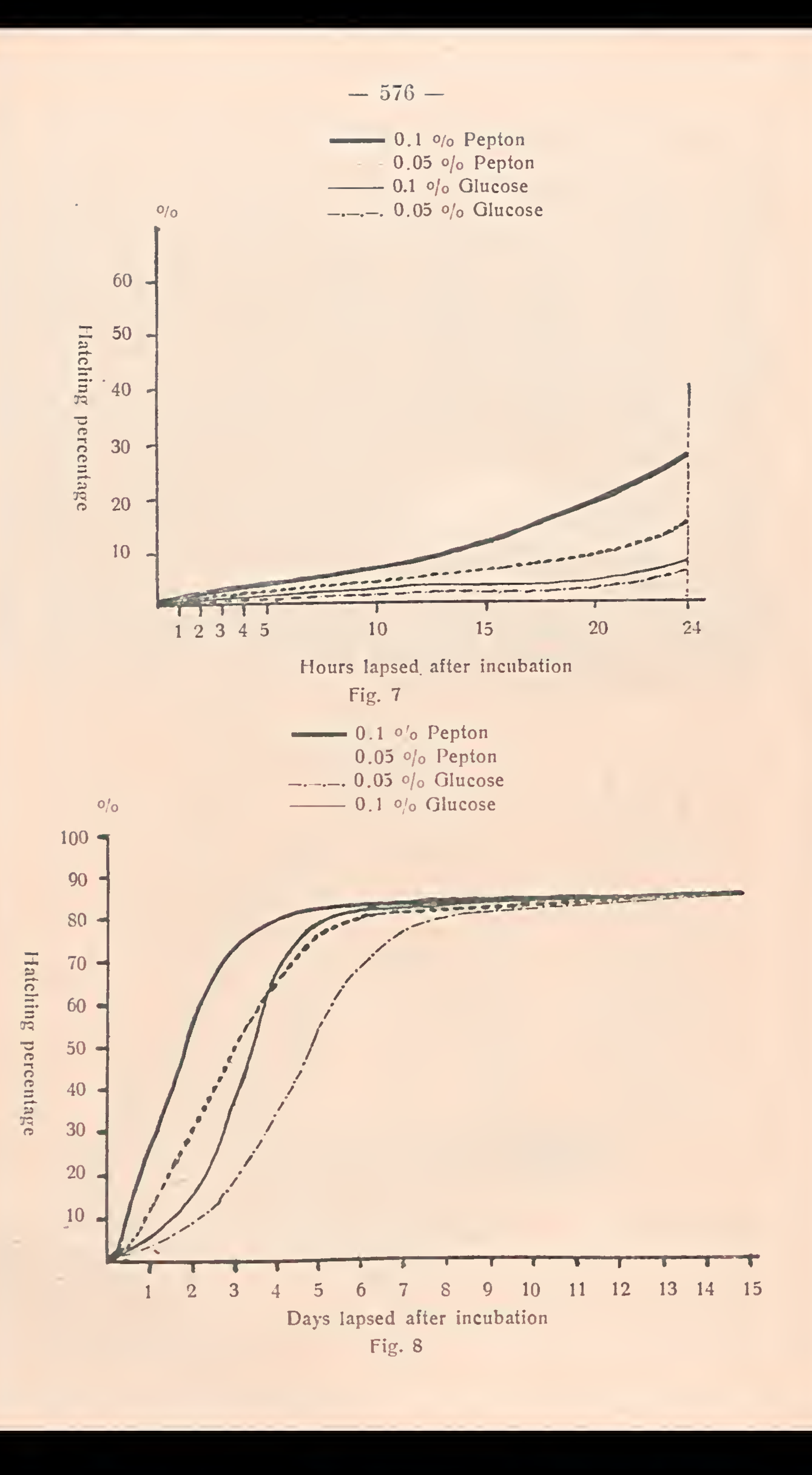

0.1 o/o Pepton
0.05 o/o Pepton
0.1 o/o Glucose
0.05 o/o Glucose
o/o
60
50
40
30
20
10
Hatching percentage
1 2 3 4 5 10 15 20 24
Hours lapsed after incubation

Fig. 7

0.1 o/o Pepton
0.05 o/o Pepton
0.05 o/o Glucose
0.1 o/o Glucose
o/o
100
90
80
70
60
50
40
30
20
10
Hatching percentage
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Days lapsed after incubation

Fig. 8

Immatured or just embryonated eggs (eggs after 7-10 days cultivation) and older one (eggs after 50 days) are both unsuitable.

Specific gravity of the eggs has also some influence on facility of hatching and the most favorable degree of specific gravity for artificial hatching is 20 degree of Baume's hydrometer.

Hatching begins at about 30 minutes after incubation and the percentage of hatching increases suddenly in pepton or gradually in glucose medium during a week until it attains to maximum.

As generally recognized. the development of ascarid eggs depends greatly upon the temperature. It is quite the same in the case of hatching. According to his experiments, the most favorable temperature is between 36° and 40° C. The hatching embryos at higher temperature are not so vigorous as those at the lower temperature and more feeble, probably because of being soaked in the medium of high temperature. In the lower temperature between 24° and 30° C. or 30° and 35° C. a few embryos hatch and they are generally active and more resistible to any chemical agent.

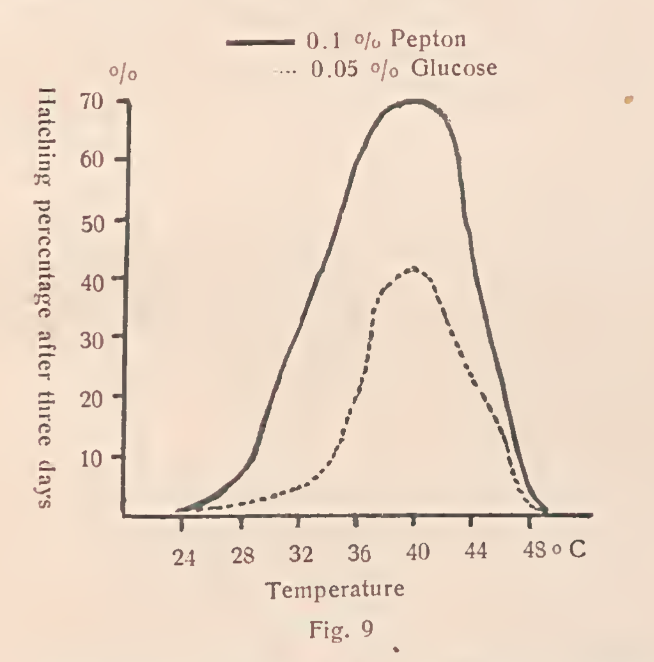


Fig. 9

In the higher temperature than 40° C. hatching takes place in small percentage an reciprocally decreases according to rising of temperature.

Observações sobre o virus do myxoma infectuoso

Arthur Moses
Assistente Chefe do Instituto de Biologia Animal, Rio de Janeiro — Brasil

Contemporaneo e testemunha da publicação do trabalho «Nota sobre a presença da larva de *Linguatula serrata*, Froelich (1789), no intestino do homem, no Brazil», cujo quarto de centenario agora se commemora, é interessante recordar que o assumpto da contribuição com que concorro ao livro jubilar, por esse motivo publicado, tambem o foi de uma das minhas primeiras pesquizas, e a materia então de palpitante interesse não diminuiu de importancia, antes cresceu com o perpassar do tempo. O virus do myxoma infectuoso dos coelhos, um dos mais curiosos do grande grupo de virus filtraveis se tornou alvo de varias pesquizas, não só, porque não se acha mais restricto aos coelhos da America do Sul, observado que tem sido na California, Estados Unidos e outros paizes norte e centro americanos, mas ainda, porque a hypothese antiga da possivel mutação de virus que desde o tempo de Jenner se achou admissivel embora não provavel, na relação entre a vaccina e o virus da variola, de novo se apresenta para o virus do fibroma infeccioso de Shope, para alguns uma variante, para outros um mutante do virus do myxoma. Mais se avigorou essa hypothese com a alteração do virus do tumor fibromatoso, que nas mãos de Andrewes perdeu de modo permanente a propriedade original para provocar apenas lesão inflammatoria e nas mãos de Shope recuperou passageiramente suas primitivas propriedades, apóz passagens seguidas em coelho sylvestre americano.

A questão das variações e mutações em microbiologia, insufficientemente elucidada para os bacterios é ainda menos clara no que diz respeito aos virus.

Damos na presente nota algumas observações ainda não registadas, chamando attenção para differenças entre o virus estudado e o norte americano sem affirmar que seja essa ultima uma variante, nem que á especie de coelho inoculado, caiba a responsabilidade dos resultados divergentes assignalados. O virus da California enviado pelo Dr. Roy Fisk, chegou-nos ás mãos, avirulento, não permittindo o estudo comparativo, visado.

Estudado por Sanarelli, retomado por Dessy e Asberastury, que, de modo irregular, constataram a filtrabilidade, sómente no anno de 1911, foi o virus do myxoma, definitivamente incluido entre os virus considerados filtraveis.

Resultados negativos e positivos a esse respeito registados, hoje se explicam pelos multiplos factores conhecidos a influenciar uma filtração em vela porosa.

E' ponto pacifico a filtrabilidade do virus em vela Berkefeld V e por vezes na do typo N.

A transmissão a outros animaes domesticos, além do coelho, não soffreu maiores modificações com o tempo. Apenas foi assumpto de novas pesquizas com resultado bastante interessante o da sensibilidade do coelho syl-

vestre, do genero *Sylvilagus*, ora da especie norte-americana (*nuttallii nuttallii*) ora da *minensis*, o mais commum entre nós.

O furão, animal que se prestou ao elucidamento de muitos pontos obscuros no estudo de diversos virus (influenza humana e porcina, doença de Aujesky, peste aviaria, etc.), não foi, ao que sabemos, ainda experimentado no myxoma.

Shope registou a passagem do virus do myxoma em coelhos *cottontail (Sylvilagus)*, inoculado simultaneamente por via subcutanea e intratesticular.

Limitada a simples orchite fibromatosa ou myxomatosa, a evolução benigna terminou pela convalescença com o registo no sôro de anticorpos neutralisantes para os virus do myxoma e do fibroma.

Não nos foi possivel conseguir numero sufficiente de coelhos sylvestres machos, para verificar a possivel adaptação do virus ao testiculo dos mesmos.

O numero limitado desses animaes, recebido, serviu para tentativas de transmissão do virus, variando as vias de inoculação, intrapleural, intracerebral, testicular com o registo negativo na quasi totalidade dos casos. O sôro desses coelhos não apresentava *in vitro* ou *in vivo* anticorpos neutralisantes para o virus inoculado.

A observação feita por Shope sobre a conservação do virus em cerebro de coelho sylvestre, nós a fizemos para o coelho domestico, *(Oryctolagus)* desapparecendo o mesmo na 2.ª passagem. Alguns desses coelhos assim inoculados morreram sem symptoma apparente, em 14 a 16 dias, outros foram sacrificados na mesma epocha. Inoculado por via subcutanea a suspensão do cerebro da primeira passagem, a infecção myxomatosa se manifestou na média em sete dias e a morte consequente se deu em nove dias.

Tentativa de adaptação do virus ao cerebro de cobaya ou rato branco, após inoculação intracerebral ou ocular, não logrou resultado. Os ratos brancos foram sacrificados depois de 10 dias e o cerebro inoculado em coelho provou inoffensivo para os mesmos.

As cobayas quando não sacrificadas morreram entre 14 e 15 dias. A inoculação da suspensão do cerebro em coelho, por via subcutanea, ora determinava a formação de um simples nodulo local, ora se mostrava sem influencia alguma. Reinoculação de uma suspensão do nodulo deixou os coelhos inoculados, normaes.

Weston Hurst adaptou ao cerebro de coelho, virus do myxoma primitivamente transmittido por via intracutanea e testicular, dando ao mesmo a denominação de neuromyxoma. O virus assim modificado e attenuado se localisava de preferencia, em determinados orgãos e permittia a convalescencia em 2/3 dos animaes inoculados.

Outra via de inoculação que tentamos foi a do conducto auditivo externo. O resultado favoravel alcançado por Levaditi e Vieuxchange com o virus de herpes e Remlinger e Bailly com o de doença de Aujesky, não foi alcançado em nossas experiencias com o virus do myxoma; alguns coelhos morreram sem contrahir a infecção e a maioria não demonstrou alteração alguma.

As primeiras culturas de virus do myxoma, obteve-as Haagen, em meio liquido contendo fragmentos de testiculos de coelho.

Seguem-se-lhe, em ordem chronologica, Benjamin e Rivers, que utilizaram, de preferencia, monocytos de coelho, tambem addicionados a meio liquido

Haagen registou em 1931, trinta passagens em meio de cultura, sem

alteração dos predicados biologicos do virus, augmentando a virulencia com regularidade em cada passagem e de modo muito sensivel nas ultimas.

No anno seguinte, Harry Plotz obteve com a technica de Benjamin e Rivers, abundante cultura com varias passagens de virus.

Com a collaboração do Dr. Abreu Martins, tentamos sem successo cultivar o virus em embryão de pinto. Empregámos embryões de sete dias de evolução e virus filtrado em vela Berkefeld V. Antes haviamos verificado que o disco Seitz, E. K., retinha o virus e que a centrifugação do mesmo em centrifugador de grande velocidade fornecia material prejudicial ao coelho.

A technica empregada foi a da inoculação de 0,06 cc. do filtrado de uma suspensão a 1/20 de tecido do tumor myxomatoso em solução physiologica em cada embryão de um grupo de 30. De 24 em 24 horas foram retirados da estufa, na temperatura de 37º, 5 embryões, feita uma suspensão dos mesmos em solução physiologica na proporção de 1/20, inoculando-se, em cada vez, cinco coelhos com 1 cc. de uma diluição a 1/20, 1/100, 1/1000, 1/10.000, 1/100.000. Assim successivamente foi feito no 1.º, 2.º, 3.º, 4.º e 5.º dia.

Nenhum dos 25 coelhos inoculados contrahiu o myxoma infectuoso.

Vaccinação: — Os primeiros resultados negativos por mim assignalados com o virus aquecido em temperaturas diversas e prazos variaveis, não soffreram contestação, antes mereceram confirmação, mesmo com o virus norte-americano.

O acido phenico e o formol, actuando sobre o virus isolado por Kessel, Proutry e Meyer, forneceram nas mãos de Fisk e Kessel um producto attenuado cuja acção immunisante foi por elles registada. Variando embora as diluições, os prazos e a technica da actuação, nenhuma acção immunisante pudemos assignalar com o virus sul-americano tratado por qualquer dos dois productos chimicos.

A actuação do chloroformio, tão util no preparo da vaccina antirabica, e do ricinoleato de sodio, com vantagem empregado na vaccinação contra a poliomyelite falharam na tentativa de vaccinação com o virus do myxoma assim tratado.

A influencia já manifestamente verificada no trato de bacterios e toxinas, animaes, vegetaes ou bacterianas por varias substancias adjuvantes e estimulantes, retardando-lhes a absorpção, provocando a lenta diffusão e contribuindo desse modo para reforçar a immunidade conferida, foi tambem por nós ensaiada na tentativa de vaccinação preventiva contra o myxoma. Dos variados excipientes graxos, lipoides e adjuvantes outros, empregados para esse fim, utilizamo-nos da vaselina e da lanolina, sós ou associados ao oleo de oliva, oleo de vaselina, etc., conseguindo assim reduzir a actividade do virus, modificar a evolução da doença e permittir ao animal supportar maior quantidade de virus sem, entretanto, conferir sensivel resistencia a futuras inoculações.

O resumo que fizemos de algumas observações sobre o virus do myxoma infectuoso leva-nos a suggerir a conveniencia do estudo comparativo das amostras norte e sul americanas e dos dois com o do tumor fibromatoso.

Acreditamos que nenhum outro se preste melhor ao elucidamento do problema das variações e mutações no largo capitulo dos virus filtraveis.

Variações têm sido admittidas em outros virus, herpes, poliomyelite, dengue, febre amarella, epithelioma de gallinhas e pombos, laryngotracheite, etc.

Ora attingem essas variações ás propriedades antigenicas, ora apenas á doença provocada.

Manifestam-se, ás vezes, em animal da mesma especie e no mesmo tecido, séde da lesão, mas em geral em especie diversa e em outro tecido.

Quando persistentes se deve pensar em mutação, quando attingem a condições antigenicas e á doença provocada, se deve cogitar da existencia de um virus novo.

A transformação do virus de fibroma em outro de myxoma obtida por George Berry e Helen Dedricks, juntando na mesma inoculação, o primeiro não modificado e o segundo aquecido a 60, 75 e 90° durante 30 minutos, levou-os a pensar que os dois pertencem a um mesmo virus basico.

Essa hypothese de identidade originaria e a possivel transformação de um em outro, em successivas passagens em coelho sylvestre, foram hypotheses cedo admittidas por quem primeiro descreveu o virus do tumor fibromatoso.

De quanto foi dito, se verifica que a continuação do estudo do virus do myxoma e do tumor fibromatoso, simples variante, mutante do primeiro, virus novo possivelmente, abre larga perspectiva ao conhecimento dos virus em geral.

SUMMARY

Great difficulty in transmitting myxoma virus to brazilian wild rabbits, either by the common route, or by brain pleural or testicular inoculation, is called attention to.

Attention is also called to failure in obtaining a neurotropic virus of the south american strain, either in rabbits, guineapigs or white rats. Survival of virus was observed in the brain of domestic rabbits only until the second passage.

Failure in obtaining virus culture in chicken embryo, seven days old, is also mentioned. A 5 % dilution of a Berkefeld V candle filtrate was employed and rabbits inoculated every 24 hours with dilutions of suspension of five embryos kept in the incubator at a temperature of 37° during five days.

Vaccination with heated virus, chloroform vaccine, formolized and carbolized virus, as well as virus enrobed in lanoline, vaseline, with or without olive oil, proved incapable of protecting against inoculation of untreated virus.

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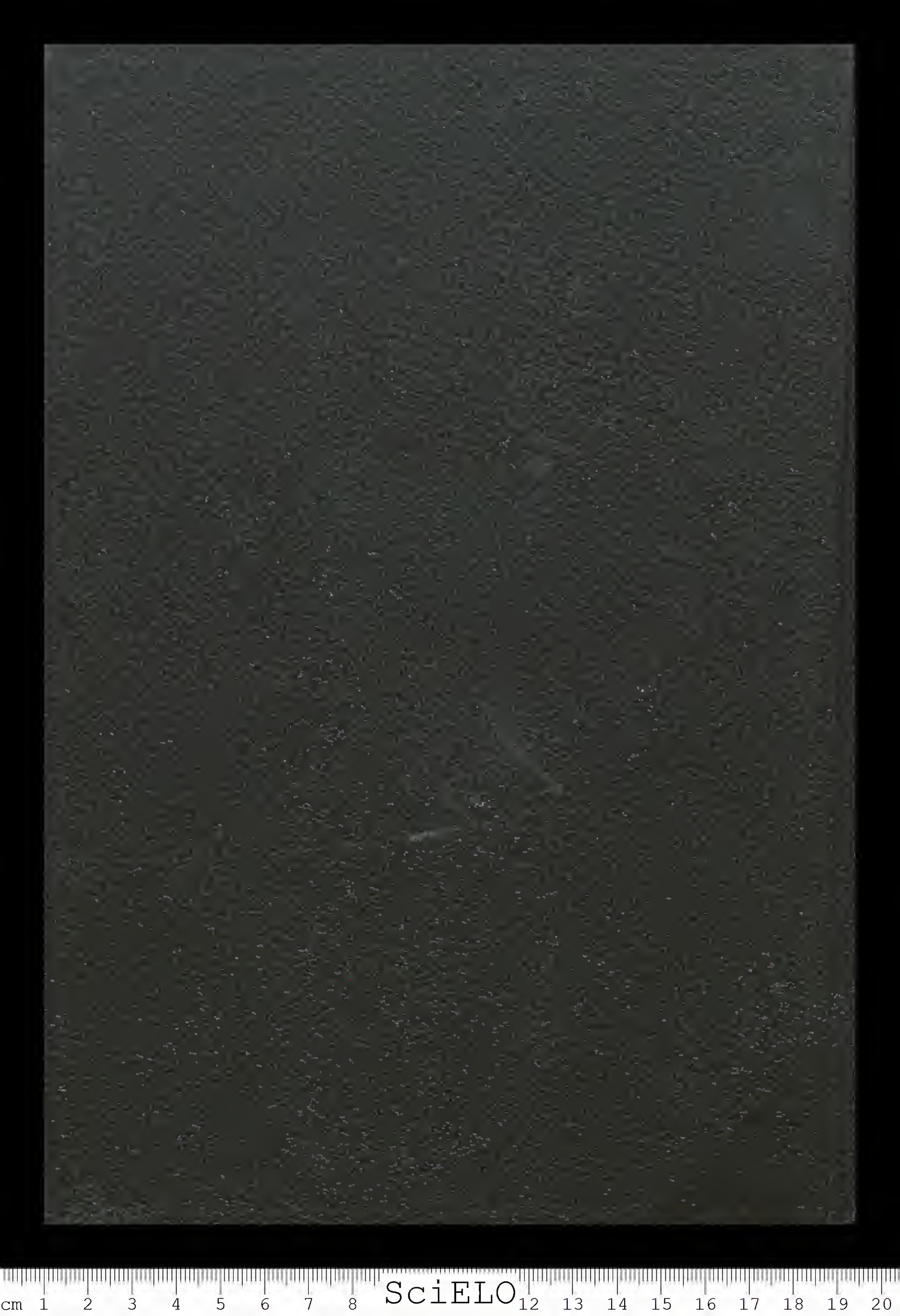
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Belmiro Silva, Bernardo José de Almeida, Nelson Ferreira, Antonio Gonçalves, Stephan Strommer. Oswaldo Gonçalves. Chrysantho Augusto de Almeida e Aristoteles Cantizano dos Santos.


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